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THE AUTOMOBILE

What It Costs to Run a Truck

Total Expense Based Upon Years of Service

In this article, the fourth in the series showing the cost of operation and maintenance of automobile trucks, the total cost per wagon-mile is treated from the same broad viewpoint as in the previous articles. Both gasoline and electric wagons are considered and various types of each, representing hundreds of cars, followed through several years of actual service. The figures show that the average gasoline truck can carry freight at six cents per ton-mile and that a corresponding service can be performed by electric trucks at seven cents. Excessive speed is the worst element of waste of both varieties of cars.

COST of automobile truck operation and maintenance may be divided into four classes, excluding the wages of the crews from consideration. These classes are as follows: Supplies, including parts and everything that is required to keep trucks in commission; second—gasoline, current and oil; third—wages of garage employees or the costs of incidental and ordinary repairs and work in garages; fourth—tires.

In previous issues of THE AUTOMOBILE, each of the latter three items has been treated at considerable length and the matter of supplies has been gone into briefly in several connections with the main subject.

In the following article the total cost of operation of trucks without reference to wages of crews or the rental charges of garages will be treated from the same wide and liberal view-

FIG. 1—PASSENGER AND FREIGHT MECHANICALLY PROPELLED VEHICLES LEAVING THE PENNSYLVANIA STATION

point as has been used in foregoing articles referred to above.

Taking the wagon-mile as the unit for comparison and computation it has been found that it costs 1.772 cents to operate a truck one mile for tires. This figure is based upon the experience of 1,000 single solid tires in actual business service under varied and typical conditions and taking the tires from

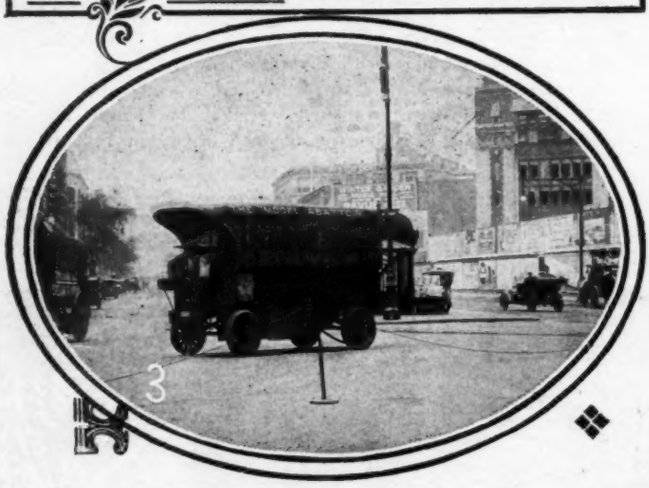


Fig. 2—Gasoline truck with four tons of merchandise
Fig. 3—The Model Abattoir uses electric trucks in its delivery service

the moment they were first installed until their worn remnants were consigned to the scrap heap.

The automobiles upon which they were used are small trucks ranging in capacity from one ton to three tons in burden bearing ability and including both gasoline and electric vehicles of numerous standard makes. The range of tire costs was from something less than 1 cent per wagon-mile to slightly over 5 cents, with the average figure as stated above.

It was proven that excessive speed is by far the greatest element of loss in respect to tire costs and that the size of the truck has little to do with the wear and tear on tires as long as an economical rate of speed was pursued. The average tire mileage delivered was almost 12,000 and the original cost in the neighborhood of $50.

The rate of speed ranged from about 10 miles an hour to more than twenty miles, with the average about 12.

There proved to be practically no difference in cost for tires used on both electric and gasoline cars, the extra weight of the electrics being counterbalanced in tire wear by the more severe engine strains placed upon the tires by the gasoline cars.

As to fuel and oil for the gasoline cars, the experience with all the trucks of this type used in this illustration showed that the cost of gasoline was 1.74 cents per wagon-mile and that oil and grease made up another item of .608 cent, thus giving a total of 2.348 cents for fuel and oil for each wagon-mile made by the gasoline cars under observation, the number of which was in excess of 300.

Considering the corresponding item with regard to electric trucks, the figures covering a period of four years show that battery and current costs and the expense for lubrication totaled 6.512 cents per wagon-mile. Roughly speaking this item may be divided into three heads as indicated. The approximate figures for each item are as follows: Battery, 3 cents per wagon-mile; current, 3 1-2 cents per wagon-mile, and oil, grease, etc., about 1 3-4 mills per wagon-mile.

In each case the average for garage work, wages of garage employees and ordinary maintenance and repair was a little over 3 cents per wagon-mile, the actual figure being 3.1 cents.

Battery costs follow the size of the truck very closely, but there appears to be a wide difference in the item of expense for current. For instance, the exhaustive tabulations show that the cost for current to run a two-ton electric truck is not much more than it is to operate a truck of half its size. Lubrication cost proportionately more for a big truck than it does for a small one.

The gasoline wagons of the same period used a certain amount of fuel which may be accurately gauged by the horsepower of the various cars involved. Thus the wagon-mile cost of gasoline cars, considering the three items, has been:

Fig. 4—Small parcels being delivered by a Brush delivery wagon
Fig. 5—Autocar express delivery wagon used for quick transportation of perishable goods

Tires	.01772
Oil and gasoline	.02348
Garage work	.03100
Total	.07220

To this must be added the cost of supplies of every kind not

included among the above items, the parts that are used for replacements, and all material and merchandise as well as extraordinary repairs requiring unusual expense such as overhaul.

A broad experience of four years shows this item to be large and exceedingly important in figuring the total cost of truck operation, and in the cars used in this illustration it amounted to an average figure of 6.06 per wagon-mile. Thus the total cost of operation of gasoline trucks proved to be 13.28 cents per wagon-mile or a shade less than 6 cents per ton-mile.

It should be noted that the cost of operating gasoline trucks has been very materially reduced in recent years. A supplementary tabulation arranged from the data covering cars used prior to 1908 shows that operative costs were much higher before the gasoline truck reached its present stage.

Considering the electric trucks in the same way as the foregoing, the figures show the cost per wagon-mile as follows:

Tires	.01772
Battery	.02984
Current	.03356
Lubrication	.00172
Garage work	.03100
Supplies	.02366
Total	.13750

It will be noted that the item for supplies is vastly greater for the gasoline cars than it is for the electrics and this is explained by the fact that the cost of battery replacements and repairs are not included in that classification but are considered as a separate item.

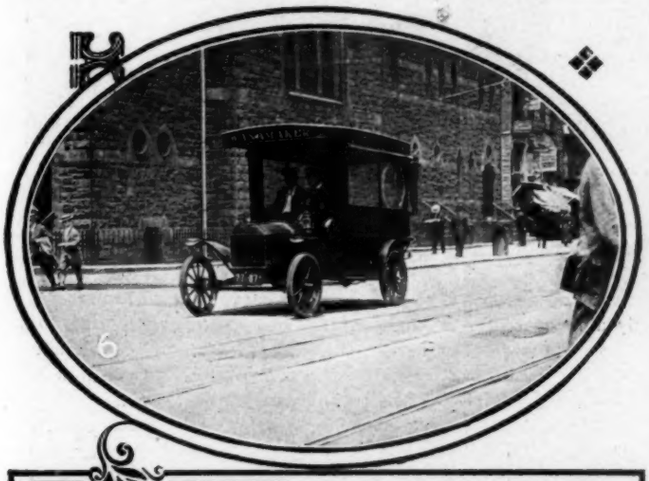


Fig. 6—Large department stores employ a fleet of small wagons for express delivery
Fig. 7—Sampson truck with box type of closed body used for heavy work by paint manufacturers

In a comparative way it may be said that the cost of operation is about the same for both gasoline and electric trucks, with the balance favoring the gasoline cars. The difference is considerably greater to the advantage of the gasoline trucks when the computation is reduced to a basis of ton-miles. The tabulations show that the cost is about 7 cents per ton-mile by electric trucks and a trifle under 6 cents by gasoline wagons.

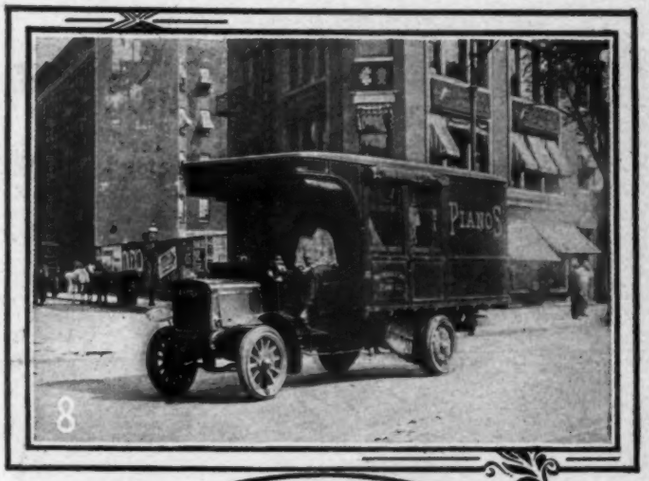


Fig. 8—Commer truck with chain cases handling pianos in New York
Fig. 9—Electric wagons have a large field in the brewing business

On a basis of 10,000 miles a year, the actual cost of operating and maintaining a typical gasoline truck would be $1,328, and for this price the truck would deliver 22,100 ton-miles of freight service. With the electrics delivering the same number of wagon miles per year the cost would be $1,375, and the ton-mileage would approximate 19,650.

Thus the gasoline truck delivers the same number of wagon-miles as the electric truck for $47 less a year, and, at the same time, on account of the larger size of the gasoline trucks used in this illustration, the ton-mileage is greater for that type of wagon by 2,450 ton-miles per year.

The best types of gasoline cars were operated at 12 cents per wagon-mile as a minimum yearly figure. These cars are modern trucks of three-ton capacity, and for a single year the ton-mileage figure has been as low as 4 cents. Other types of three-ton gasoline trucks have averaged 4 1-2 cents per ton-mile and those of smaller size run to larger figures in the ton-mile computation.

Referring to the experience with the earlier gasoline trucks, it may be said that the excessive operative costs were due solely to mechanical crudities which have been corrected in large measure in the wagons of current use. Some of these ran as high as 15 cents a ton-mile and delivered a comparatively small number of the revenue-producing units. This made a bad showing for gasoline-operated automobiles in comparison with the electrics and

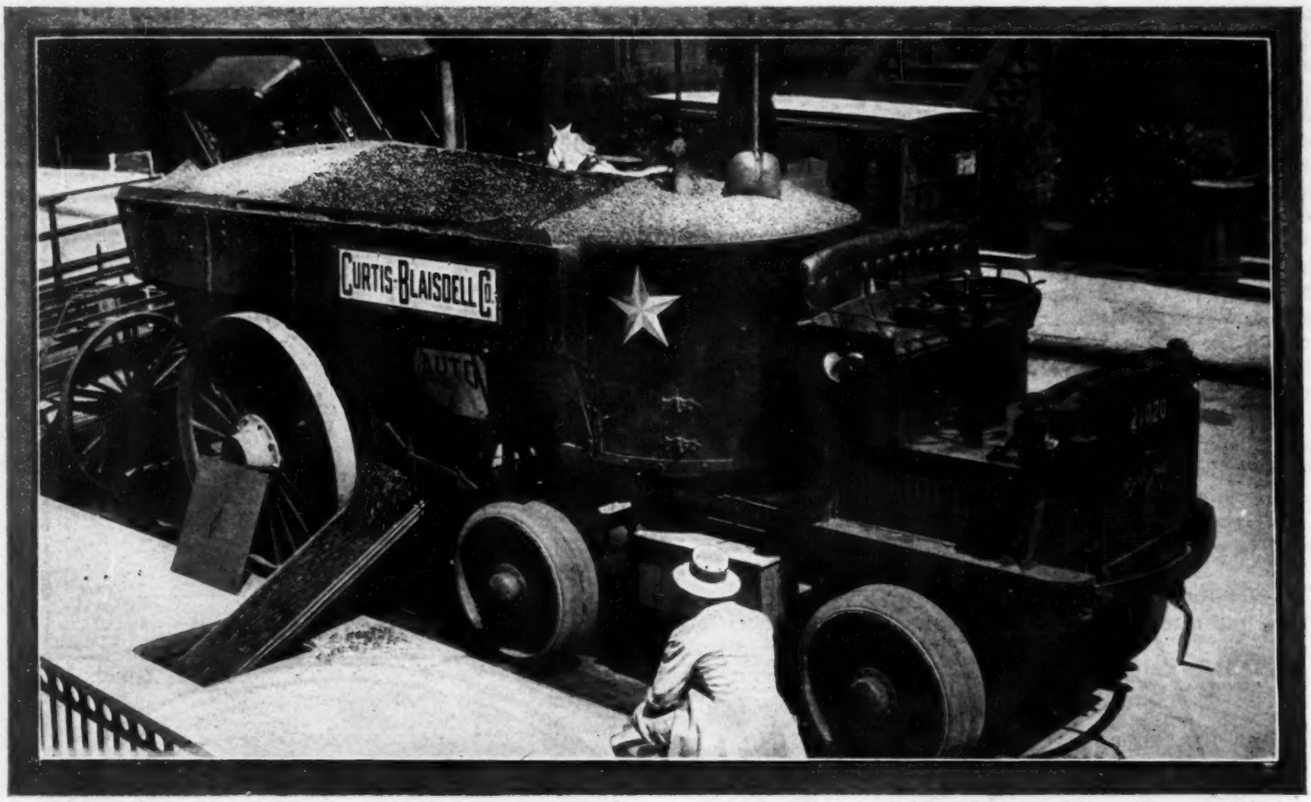


Fig. 10—Couple-gear gasoline electric truck delivering ten tons of coal

for a time checked the extension of the lines of gasoline trucks.

The situation touching the electric truck operative costs is set forth in much detail in the data at hand. The best figures for one-ton trucks are about 8 cents, while the most economical of the two-ton types cost about 9 cents to operate and maintain. The two-ton electric truck stands out sharply as the more economical to operate on a ton-mile basis, as the total cost in this respect for the best types of electric trucks observed was 4 1-2 cents per ton-mile for year after year. They were no harder on tires, used very little more current and delivered twice the ton-mileage shown by the smaller vehicles.

As an illustration. On a basis of 9 cents, the cost of operating a two-ton electric truck for 10,000 miles in a year would be $900, delivering 20,000 ton-miles without overloading the wagon. The best of the smaller trucks cost $800 to deliver 10,000 ton-miles. Without regarding garage rentals and the wages of the crews and assuming that the gross revenue from this freighting would be 10 cents a ton-mile, the revenue from the larger truck would be $2,000 gross or $1,100 net in the course of a year. Of course the revenue from hauling is probably much more than 10 cents per ton-mile.

Turning back to the gasoline situation as above, the basis of computation of 10 cents per ton-mile would make the average revenue of the gasoline truck $245 greater than that of the electric at a cost of $47 less per year, thus indicating an economy in operation of the gasoline over the electric of $292 a year.

However, these figures may be a trifle unjust to the electric because the cost figures of the ancient and expensive gasoline trucks were eliminated and all the data at hand were used with reference to the electrics.

Applying the pruning knife to some of the worst specimens of the electrics included in the data, it is found that the modern cost figures would probably be made more nearly approximate if a certain series of old one-ton trucks could be eliminated in the same way as the wasteful types of gasoline cars. For instance, a few years ago there were about 100 trucks of this kind in service, the data for which constitute a part of the material at hand. These trucks cost 23 cents a ton-mile to operate for two years and by cutting them out of the calculations the result probably leaves the total figures very close to the actual present cost of truck operation. While the gasoline cars eliminated numbered only a few, practically all of which are now out of service, the electrics under the knife are still in service to a considerable extent. The elision leaves the wagon-mile cost of operation at 13 1-6 cents and makes the ton-mile cost under 7 cents.

If there is anything typical about the kinds of one-ton electric trucks that are included in the tabulations, it would appear that this size of wagon is not suited to competition with cars of double its size and being comparatively uneconomical in operation must give way to the larger cars.

But the most astonishing thing shown in the figures covering all the stages and phases of truck operation is the steady growth of economy in cost. While the price of freight automobiles remains substantially level and has done so for the whole period covered, the quality and mechanical excellence of the cars has increased. Dollar for dollar there is more value in the cars of the present than there was in the cars of the past, no matter what the price.

This increase in efficiency and economy may be shown briefly as follows:

In 1907 the gross cost per wagon-mile was 15.8 cents, based upon all the trucks used in this illustration. The gasoline trucks cost 24 cents per wagon-mile and the electrics 14.655 cents. The following year the wagon-mile cost was reduced to 15.09 cents, in 1909 to 14.17 cents and last year it came down to 13.56 cents.

This was accomplished in various ways, one of which was, of course, to eliminate the gasoline-eating and current-wasting machines and to substitute in their places cars typical of the state of the art. In order to show just what a potent cause in behalf of economy such practice proved to be, it is illuminating to know that the general proportion of cost was not disturbed by reason of the arbitrary culling out of the non-economical cars, resorted to in this article in an effort to approximate actual present costs.

With these eliminations the 1907 figures were 13.98 cents per

Fig. 11—Ice cream manufacturers are taking advantage of the new means of locomotion

wagon-mile; 1908, 13.89; 1909, 13.75, and 1910, 13.13. It is likely to be still further reduced in 1911 by reason of equalizing the efficiency of tires, so as to get uniform mileage out of complete sets, by enlarging the carrying capacity of electric trucks, by the substitution of small gasoline cars for the electrics of corresponding size and by a stern and rigid check on excessive speed.

One of the striking things about the situation is the larger mileage achieved by the automobile truck in 1910, compared with former years. In 1907 the general wagon-mileage was under 9,000, while in 1908 it was 500 miles greater. In 1909 the trucks made 10,300 miles and last year the figures were just short of 12,000 miles. Naturally these high figures are not general averages, but they do represent the performance of the best classes of trucks, some of them as much as four years old.

Tour to Water Gap Is Delightful

Fine Roads and Beautiful Scenery on Route

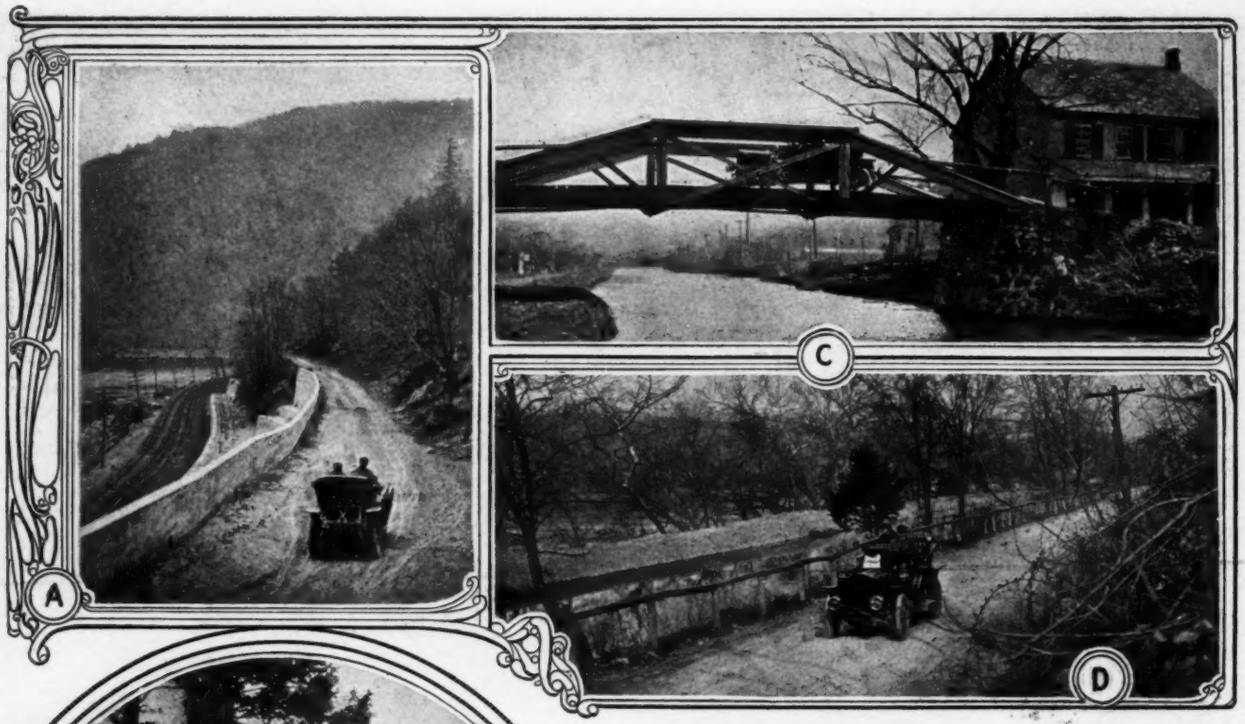
Among the finest two-day runs afforded in the East is the tour from New York to Delaware Water Gap and return. This route carries the tourist through the hills of northeast Jersey and southeast New York, past Tuxedo and through the beautiful country lying to the west. The way reaches Port Jervis and enters the picturesque country near the Gap over smooth, well-kept roads, bringing up at the chasm in the hills through which the Delaware River flows down to the sea. The return trip takes the party down stream, crossing into Jersey and mounting the Schooleys on the way to Morristown.

ONE of the puzzling questions that constantly confront the car owner is: Where shall we tour? and it is answered in so many ways and so differently that the owner is often more confused by the advice he receives than helped by the suggestions offered. If he has tried the New England hills and the Connecticut, Long Island or Jersey shores, or even if he has not, he might try a run to Delaware Water Gap some Saturday and return through Jersey the next day.

He will not be disappointed in the roads, for they are among the best on this side of the world. There will be no hardships from one end of the trip to the other and the scenic beauties compare favorably with anything to be seen in this part of the country. In fact, there are spots along the way that rival in grace and beauty any in the world. There will not be a monotonous moment during the trip if diversity of scene and calm enjoyment of nature's smile have the power to charm.

The trip is not arduous in any way, the roads being well-nigh perfect and the mileage moderate.

Starting from New York City in the mid-forenoon the tourists proceed to the Fort Lee Ferry across the Hudson at One Hundred and Thirtieth street. By following Route 18 of Volume 3 of the Blue Book the landing is made on the Jersey shore at Edgewater which lies at the foot of the Palisades. There is a long, stiff climb to the summit, but the hill is not so steep as



A—Where the Delaware breaks through the granite hills
B—On the road to Milford town through the woods
C—One of the many bridges that span the canal paralleling the Delaware
D—Leaving Port Jervis on typical road of the section

to cause trouble if a little care is devoted to shifting gears. Fort Lee village lies on top of the hill, from which on a clear day a view of Washington Heights and the full sweep of the North River waterfront of the metropolis may be had. This view will give a better idea of the immensity of New York City than the most perfervid descriptive pamphlet, no matter how voluminous.

After crossing the backbone of the ridge the way descends to Overpeck Creek, and then crossing the Hackensack River just before reaching Hackensack, the party passes through that village on the way to Arcola. The old mill that has done service for generations is one of the interesting sights to be seen here.

The road, splendid macadam, continues through Hohokus to Suffern, which is just across the New York State line. Here the road divides, one branch following up to the Hudson River at West Point and the other bearing straight ahead to the crossing of the Ramapo River, thence to Ramapo and Sloatsburg, reaching Tuxedo about two hours from the start. Tuxedo is a resort for New York millionaires and is considered to be one of the most magnificently improved suburbs in the world.

From Tuxedo the way is through Southfield, Monroe, Chester and Goshen. From Goshen to Port Jervis the road is through one of the richest agricultural sections of New York. The country is varied in aspect, rich and rolling and with enough timber to afford a wealth of color and shadow to the landscape.

This road passes through Denton and Statehill station over Shawangunk mountain, descending a long grade with several interesting turns and sharp curves. A short distance farther the road winds through the village of Tri-States and reaches Port Jervis at Front and Pike streets.

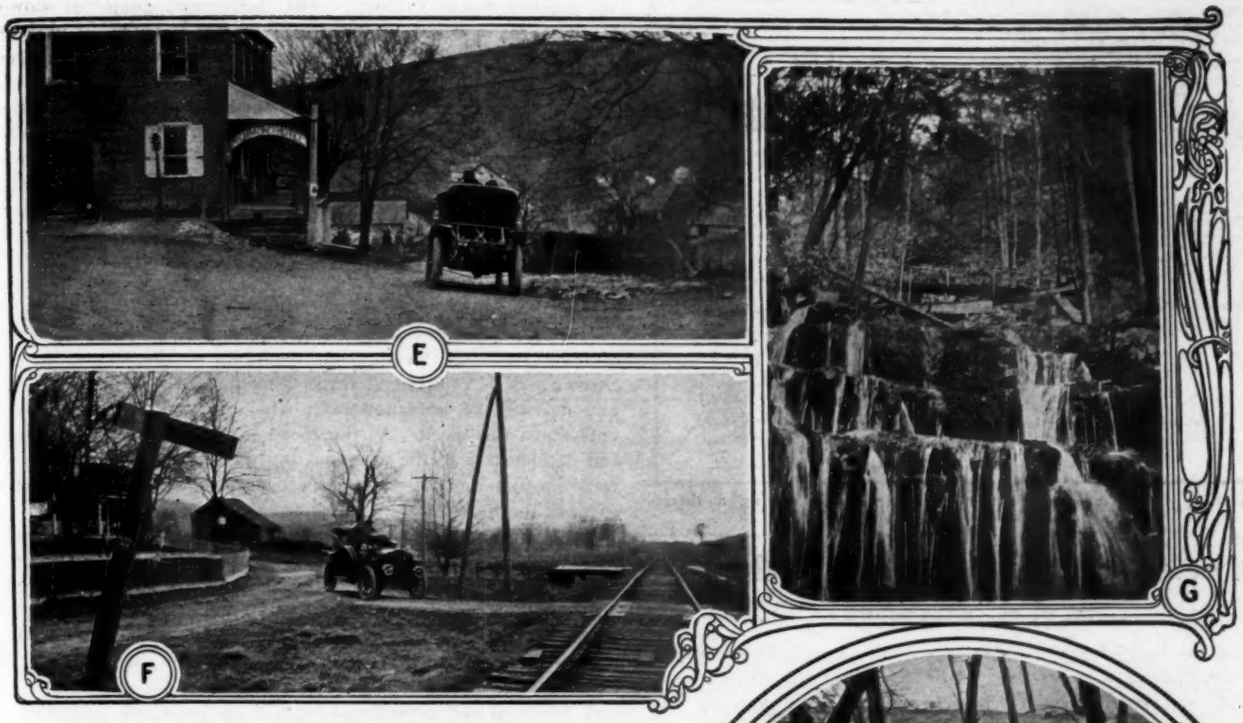
The run so far has been 76.4 miles, a nice easy jaunt of four hours. There are a number of excellent places at Port Jervis where the party may have luncheon, after which the rest of the run to Delaware Water Gap may be finished with ease through the most picturesque section of the hill country.

Route 341 of the Blue Book is the favorite way to pursue from Port Jervis to the Gap and passes over fine roads, the base of which is shale. The road follows down the Delaware River Valley and is noted as being one of the favorite runs for automobilists. It is supremely picturesque and must be seen to be appreciated.

Crossing the Delaware into Pennsylvania the way leads to Milford through a scene of natural beauty that would be hard to equal on a Summer day, and following west and south it crosses Sawkill Creek. The woods are a magnificent feature of this stage of the journey, although every turn of the road develops some new natural beauties. At Dingman's Ferry and along the way leading to it there are some delightful waterfalls to center attention. The creek is crossed by a modern iron bridge, but the ruins of the old bridge and ferry form an interesting point.

Egypt Hills, Bushkill station, Shoonmaker, Echo Lake are passed in order and the party reaches Shawnee-on-Delaware in about two hours' leisurely run from Port Jervis, the mileage being 36.3.

The rest of the way is largely up grade to the North Water Gap postoffice, where the hill road crossing Cherry Creek brings the tourists to the end of their journey.



E—Stopping at a wayside inn high in the hills
F—After leaving Shawnee in the final run of the first day
G—Typical scene in the mountains west of Port Jervis
H—In the heart of the Delaware Water Gap

There are numerous hotels at Delaware Water Gap, several of which are said to be of first-rate class.

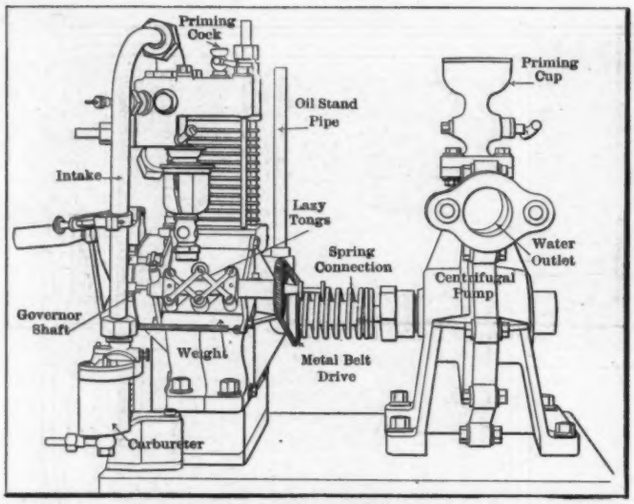
The return trip through New Jersey is delightful and interesting but entirely different from the outward-bound journey. Following Route 332 out of Delaware Water Gap the run to Morristown, N. J., is only 50.7 miles. Leaving the Gap the party trends southward along the Delaware River to the old-fashioned cable ferry, where the automobile is embarked upon a flat boat and pulled across the stream to Myers Ferry, N. J. From the landing the way rises gradually and then sharply, passing Hackettstown. The towns along the way south of the Gap are: Portland, the Ferry, Delaware, Bridgeville, Butzville, Townsbury, Danville and Meadow Station.

Continuing nearly straight ahead into Main street, Hackettstown, the party passes the Soldiers' Monument and crosses the Musconetcong, where the ascent of Schooley's Mountain commences. At the crest of this beautiful hill is a wonderful view of the Musconetcong and German valleys. This section used to be one of the leading resort districts of New Jersey, and the reason for its not maintaining that rank is difficult to understand. The descent is also sharp and complicated with a dangerous horseshoe curve. The grade is about a mile and a half in length and the roads on both sides of the mountain have been finely improved, which adds materially to the pleasure of the trip and makes for safety of the tourists. Reaching German Valley station the road turns left after crossing the stone bridge and proceeds to Chester, Mendham and into Morristown. If a late start was made from Delaware Water Gap, it may be well to have luncheon at Morristown, where there are a number of creditable hotels. This little city has an immortal place in history as the headquarters of Washington in one of his Jersey campaigns.

From Morristown to New York there are several fine routes, but the choice will probably fall upon Route 126 on account of the two fine, easy climbs over the Watchung Mountains over splendidly improved roads. This route is via Florham Park and Newark and is 31.1 miles in length, entering the metropolis by the Weehawken Ferry at Forty-second street. The route takes the party through Madison, Florham Park, mounting a small hill and passing across the Passaic. Then comes the climb over the Watchungs, beginning with a long, steep grade across the first range and then, after a dip, commencing the climb over the second barrier, which is accomplished by a gentle and smooth ascent.

From there into South Orange the road sinks away smoothly into the plain and reaches Newark via Central avenue and Washington street. The way to New York through the New Jersey metropolis follows Bridge street, crossing the Passaic to the new tarred macadam road connecting with Hudson Boulevard, Morgan street, Bull's Ferry road, Third street, to the Weehawken Ferry.

The entire distance of the return trip is 81.8 miles, and for the whole journey out and back 197.9 miles. There is scarcely a mile of the way that is not well improved and well maintained, and the whole trip ought not to cause a moment's uneasiness to the automobilist. Garages and tire stations are frequent throughout the route, but with the fine roads there is little reason to anticipate needing them.



Illustrating one-horsepower air-cooled gasoline motor driving a direct-connected centrifugal pump

Direct-Connected Motor and Pump

The greatest efficiency possible is always secured by means of direct drive between the power plant and the driven piece of machinery. Where direct connection is possible the wear and tear of bearings and gearing is done away with, thus reducing the cost of up-keep.

THE accompanying illustration will give an example of how a pump may be connected directly to a gasoline motor. Of course where a reciprocating pump is used the only way possible to secure a direct drive is by having an engine with an opposed water cylinder. The centrifugal pump, as shown in the cut, can be connected directly to the extended crankshaft of the motor, and is driven at the same number of revolutions per minute as the gasoline motor.

The noticeable features in this plant are the spring connection between the motor and the pump and the governor on the motor. The spring connection is a safety device. In case the pump should, for any reason, become clogged so that it is jammed, the spring joint will be broken instead of the shaft. The spring can be easily relaxed, while to replace the shaft would be a very costly proceeding, not to mention the fact that many other parts may be broken.

The governor is of the centrifugal type. It is driven by a wire belt off the crankshaft. As the speed of the motor rises above normal, the weights on the joints of the lazy tongs are thrown out by centrifugal force, thus contracting the lazy tongs and moving the governor shaft which throttles the motor and cuts down the speed. As the speed is reduced the weights will fall back nearer to the axis and the throttle rod be pushed forward so that the throttle will be again opened and will remain so until the motor rises above normal speed.

The motor shown in the cut is a small one of one horsepower lubricated by gravity and splash and cooled by air. The pump and motor are assembled on the same base, which is so constructed as to bring the engine and pump shafts on the same level with each other. This gives a very light and compact little plant and one which may be used in a great variety of ways.

A pump of the centrifugal type is of great use in pumping water against a small head. When the back pressure runs up high there is a large percentage of the total efficiency lost in slip. This is true, of course, of the reciprocating pump as well, but not so much as in the case of the centrifugal type. This combination would be an ideal one if used for pumping the circulating water through a condenser in a steam yacht.

Concerning the American "30"

Latest Effort from the Plant at Indianapolis

It is worthy of note that the underslung idea is being continued by the maker of this car, and the idea here is to present a strictly mechanical version of the ramifications of the new product, showing the relations of components in the makeup of the car.

REFERENCE may be had to Fig. 1 for the general appearance of the new "30" model showing an underslung spring suspension and an enclosed type of body, with admittance to the tonneau on both sides, but the right side of the fore part of the body is blind, leaving room for the side

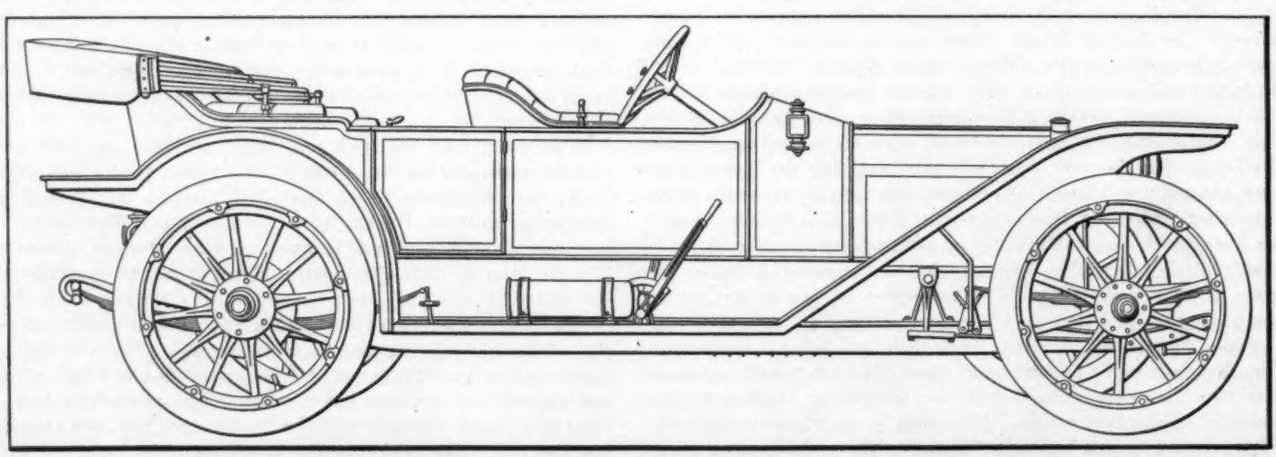


Fig. 1—General appearance of the new "30" American with flush-sided body, the front compartment being fitted with only one door

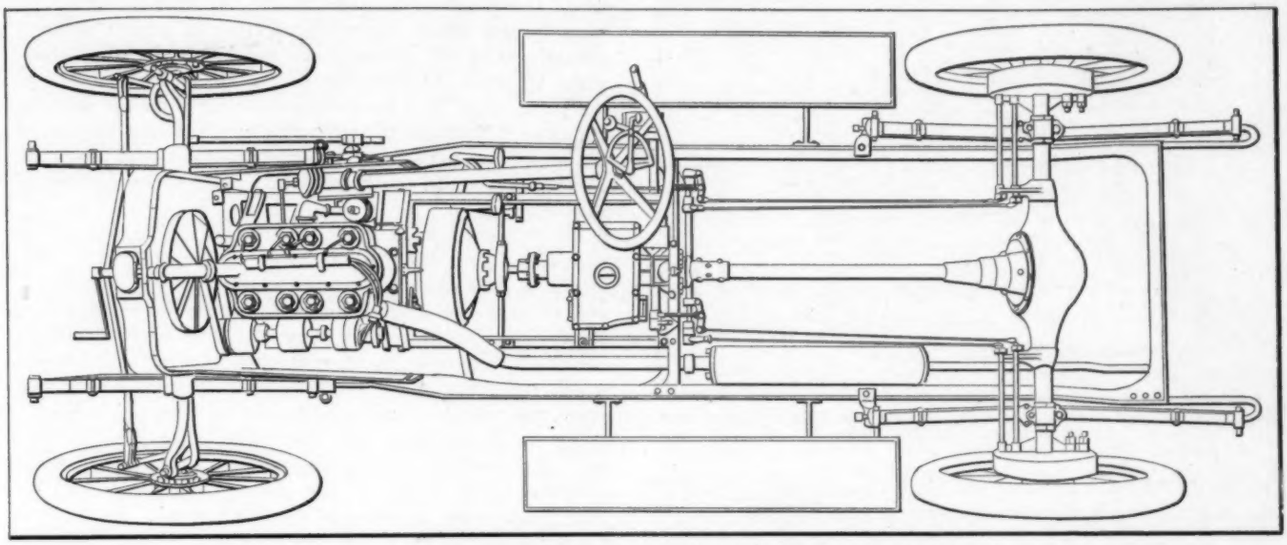


Fig. 2—Plan view of the "30" American chassis, showing the relation of the different parts

levers in the manner as shown, admittance being to the front seats by a fore-door on the left-hand side of the car. The general appearance of this model conforms to the broad idea of the American Motors Company, of Indianapolis, Ind., remembering, however, that a year's practice has brought about its refinements, leaving a certain indefinable something about the car as here shown that is not to be described in terms that fit the mechanical treatment of the car.

The plan of the chassis is shown in Fig. 2 with the radiator at the front of the motor placed far enough back on the side bars to clear the axle. The motor, including the transmission, is mounted on a sub-frame, making a substantial platform for the power plant, terminating in a crossbar back of the transmission gear, where a universal joint is placed at the extremity of the torsion tube, the latter enclosing the propellershaft so that the power of the motor is transmitted therefrom through the clutch housed in the flywheel, thence to the three-speed selective-transmission gear and to the propellershaft through the universal joint, thus delivering the power at the point of contact of the rear road wheels through the live rear axle. The scheme involved in the chassis construction for the purpose of taking advantage of the underslung plan of suspension is shown in Fig. 3.

How the Block Type of Four-Cylinder Motor Is Made

The four-cylinder block type motor is rated at thirty horsepower when the speed is 1,000 revolutions per minute. It is of the four-cycle type, water-cooled with four vertical cylinders, with a bore of 4 3-8 inches, and a stroke of 5 inches. The right-hand side of the motor is shown in Fig. 4 with the carbureter C1 in the mid-position, and the intake manifold leading up therefrom to a flanged orifice in the cylinder heads in the manner as shown. The motor is suspended by integral arms B and B1 reaching to the sub-frame, and the starting crank has its support S1 integral with the crankcase, although in the assembling of the chassis a crossbar at the front carries an outboard bearing lending stability to the starting crank support.

A cover C shown on this side of the motor, enclosing the valve mechanism, and the water manifold W is faced off and bolted to a finished face on the top of the block casting, which seems to be one of the most recent and approved ideas in water connection work. The bottom of the crankcase, which composes an oil reservoir, is provided with draincocks D and D1. Referring to Fig. 5 of the right-hand side of the motor the magneto M of the Bosch dual type is mounted on a ledge, taking its drive through a shaft terminating in a gear which meshes

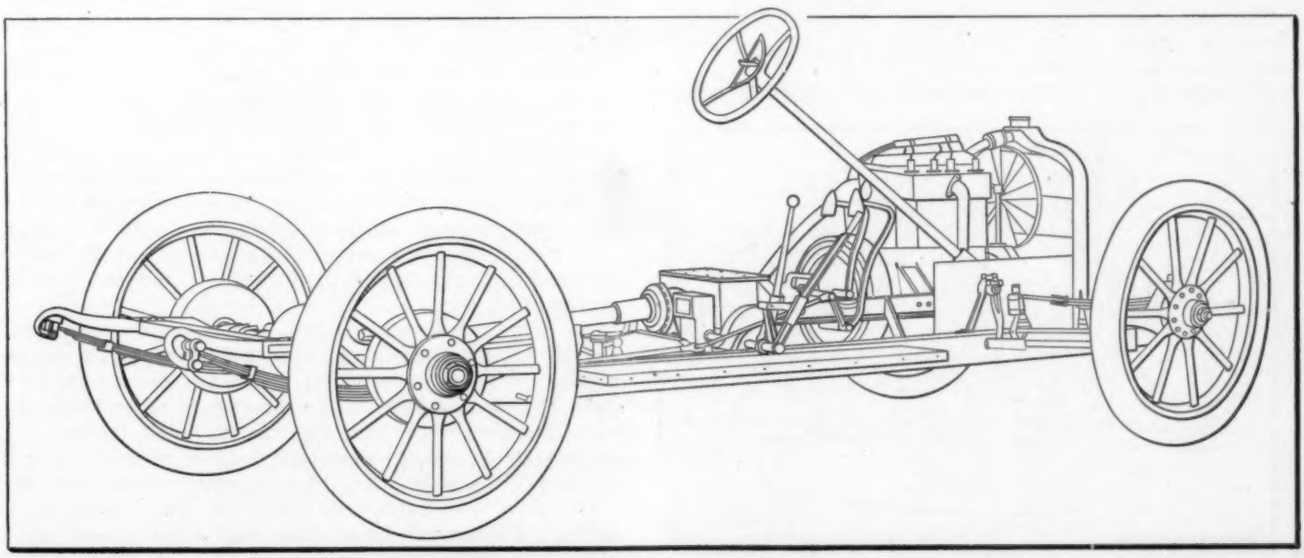


Fig. 3—Three-quarter view of the American chassis, showing the underslung feature, the method of suspension and the sub-frame, carrying the motor and transmission

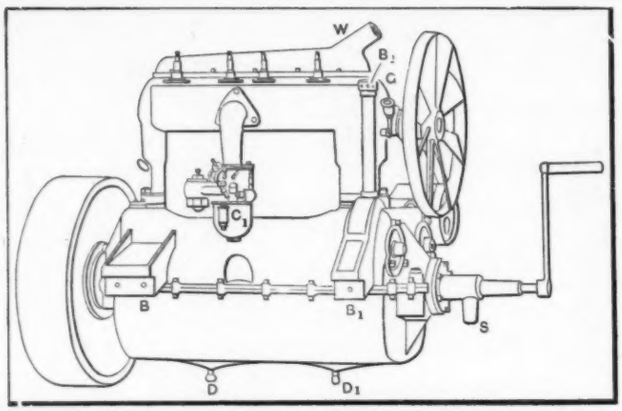


Fig. 4—Right-hand view of the motor, showing the short carbureter intake manifold and enclosed valves

in the half-time train, and the shaft is extended on through the water pump P furnishing power thereto and thence to the front of the motor with a pulley secured thereon, accommodating the belt B that drives the fan F1 as it is located between the radiator and the motor. Remembering that the motor is of the T-type with inlet and exhaust valves on opposite sides, it will be seen that a cover C is placed over the valve mechanisms on this side of the motor.

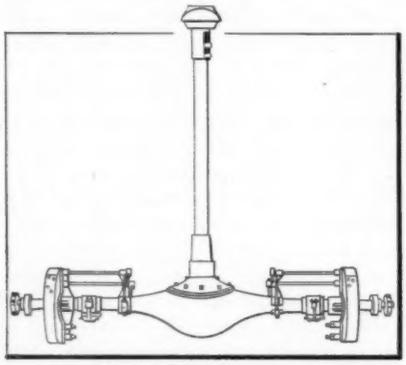


Fig. 6.—General appearance of the rear axle, showing the propeller tube casing with ball socket end

The exhaust manifold is cast integral with the cylinders and is therefore watercooled, terminating in the extension M1, which is bolted to the rear end of the cylinders and suitably connected to the exhaust pipe. The general appearance of the motor is very clean and some idea of the accessibility can be obtained from Fig. 3. The pistons and cylinders are ground and the former are fitted with four piston rings each. The timing gears are cut spiral with the object of eliminating any noise in this part of the mechanism. A system of splash oiling has been adopted, the various levels being maintained by means of internal webs. The bearings are large in diameter and are die-cast and scraped to fit.

The clutch is of the inverted cone type, the male member being faced with a suitable material to take the drive; spring plungers are placed under the surface to permit of easy engagement and in a measure elimate the shocks of starting. In order to make the operation of the clutch as light as possible the pedal arms have been designed with sufficient reduction to eliminate the fatigue in traffic driving. Between the clutch and the transmission is placed a universal joint to compensate for any bending action of the chassis, caused by inequalities of the road.

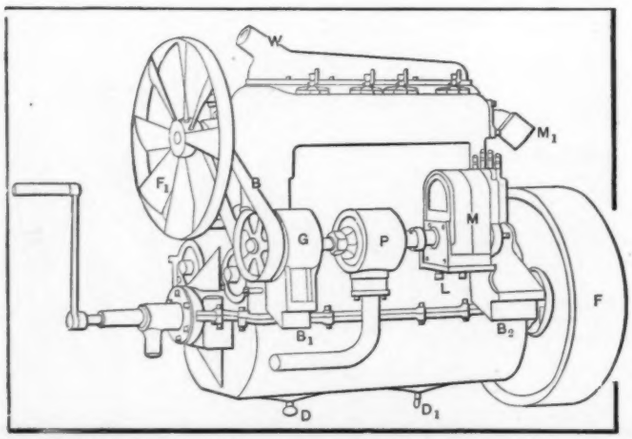


Fig. 5—Left-hand view of the motor, showing the arrangement of the magneto, pump and fan drive, together with the integral cast exhaust manifold

The transmission is located amidships and is easy of access by removing the floor boards under the driver's feet. The casing is of cast aluminum and is shown in Fig. 11. It will be noticed that the gear-shifting mechanism is entirely encased, thereby insuring efficient lubrication. The forward end of the housing is extended to accommodate annular ball bearings on which the shafts are carried. Three forward speeds and reverse are provided, and a gear-shifting lever is equipped with a ball handle so as to give the driver a good purchase. The gear wheels are made of special steel, heat-treated and tempered, and the same applies to the primary and secondary shafts. The direct drive is obtained on third speed. At the rear of the transmission is located the housing providing for a ball end thrust for the front end of the tubing which encloses the propeller shaft.

As will be seen by referring to Fig. 3, the front and rear ends of the springs are shackled, thereby eliminating the drive from the springs. The rear axle, shown in Fig. 6, is of the full-floating type, the tubular extension of the housing being fitted with ball bearings upon which the wheels are mounted. The housing is a pressed-steel forging, the front end being provided with a cover which receives the rear end of the propeller shaft casing. The jackshafts fit into the differential at one end, and the external ends are provided with dogs which drive the wheels through suitable slots cut in the hub.

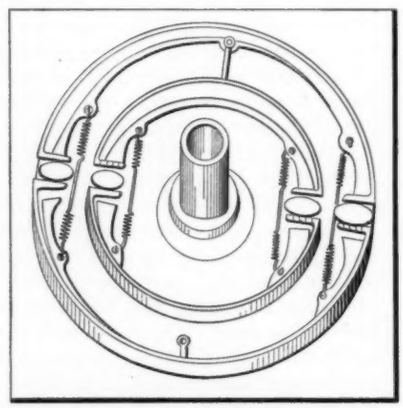


Fig. 7—View of the rear brake mechanism with the wheels removed

The differential assembly will be seen in Fig. 8. The crown wheel is attached to the exterior of the casing by means of bolts, and the casing is fitted at its two extremities with ball bearings which rest inside the axle casing. The brake drums which are attached to the rear wheels have two facings of different diameters to accommodate the two sets of brake-shoes shown in Fig. 7, both being of the internal expansion type.

Following along the lines of previous American practice, the wheels are of larger diameter, fitted with Q. D. demountable rims and 36 by 4-inch tires. The wheels are of the artillery type made of second-growth hickory with ten spokes front and twelve spokes rear.

The front axle shown in Fig. 9, is an I-section drop forging, with the cross-tie rod placed in front. The axle has a clearance off the ground of 10 3-4 inches, and is the lowest point of the car. The steering knuckles are fitted with roller bearings on which the front wheels run, and are attached to the main body of the axle by means of casehardened and ground pivot pins; they are fitted with grease cups to insure proper lubrication.

Both front and rear springs are of the semi-elliptic type, the method of suspension being shown in Fig. 3. The steering is of the irreversible worm-and-gear type, and is attached to the chassis frame by means of two feet, the drop arm which is

fitted with a ball socket being placed exterior of the hood. The control levers are placed in the center of the steering wheel, which is 18 inches in diameter, and operate the control rods through two sets of bevel gearing which can be seen in Fig. 10.

The wheelbase is 118 inches, and the general equipment of the car includes top with dust cover and side curtains, five lamps, Prest-O-Lite tank and quick-demountable rims.

In addition to the "30" model, the 50-horsepower model will be continued in its present form with the exception of a few modifications, but in order to accommodate a six-passenger touring body a 140-inch wheelbase chassis may be had at the option of the purchaser.

It is proposed, in the near future, to place on the market still another model with practially the same features as mark the one herein described—for instance, the underslung frame—and the size of the motor will be 3 3-8 inches bore by 4 1-2 inches stroke.

With the coming demand for some provision of furnishing electric light for the lamps, the motor of the 30-horsepower model has been arranged for the installation of an electric-lighting outfit, the drive being taken from the pumpshaft by means of a belt. Considerable additions have been made recently to the size of the factory and it is the expectation of those connected with it to materially increase the output for the coming season, which will be largely due to the addition of the 30- and 20-horsepower models to the line.

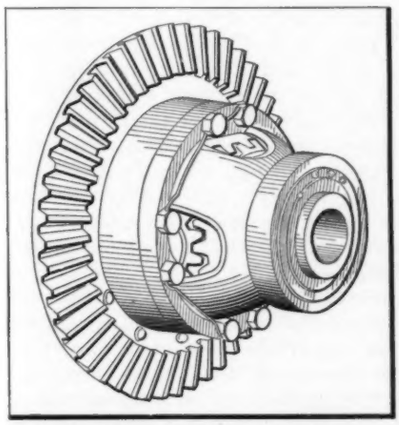


Fig. 8—Differential unit, showing how the crown wheel and ball-bearings are mounted on the cage

The price of the new "30" model is fixed at $2,250 with the style of body work as shown in Fig. 1, together with a complete equipment as above described. The bodies are made of sheet steel on a seasoned ash framework, and owing to the underslung chassis the passengers are brought lower than in the ordinary type, thereby causing the center of gravity to be considerably lowered. The advantage claimed for this in conjunction with the large wheels is that the turning-over effect is thereby decreased.

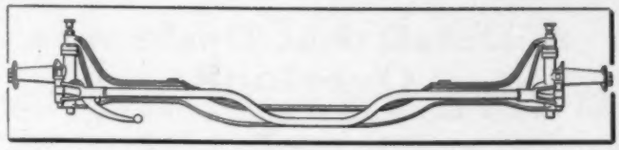


Fig. 9—View of the front axle, together with the connecting rod

THAT noise in a motor is in most instances a sign of low caste or improper feeding—or both.

THAT the motor that hums contentedly, like the bee that does likewise, is usually on the job.

THAT the buyer who takes nothing for granted, but insists upon being shown, need not necessarily be from Missouri.

THAT the owner of a tonneau is *persona grata* with the neighbors if he "comes across."

THAT the idea of reforming the maker of a poor product by taking it off his hands is not necessarily a good one.

THAT you are on the wrong scent when you are not open to conviction.

THAT each succeeding day brings the automobile nearer perfection; ambition, like a torrent, never looks back.

THAT a consistently bad performer is a good thing to avoid; it is well to profit by the folly of others.

THAT the car bought, with the assistance of a catalogue only, without a thorough examination, will in all likelihood soon be a "standing" advertisement of the buyer's gullibility.

THAT it is just as important to look into the antecedents of the car you are about to buy as it is to have a title "searched" before you invest in real estate.

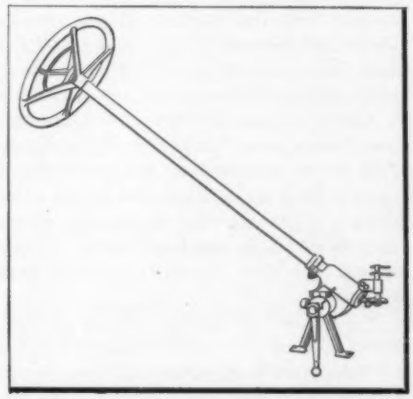


Fig. 10—Showing the steering gear together with the method of attachment and means of operating the control levers

THAT your membership in the Sons of the Revolution is no excuse for your being consistent and investing in an automobile of colonial design.

THAT fortune does not wait at any man's door; she must be sought and wooed before she will surrender.

It Stands to Reason—

THAT an automobile that gives off a variety of odors is afflicted with a similar variety of disorders of its internal organs. It needs a stomachic.

THAT a chauffeur whose breath attars the air with alcohol fumes needs a permanent substitute.

THAT an indolent person is lacking in understanding—not liking work, he carelessly smears the body of his car with sticky matter which he has to clean off.

THAT a tyro in the automobile art should not be assigned the task of adjusting a carbureter.

THAT misery is the concomitant of undue haste in the selection of an automobile.

THAT the well-behaved motor of good antecedents usually shows its class by the quiet and business-like way it goes about its duties.

THAT the recurrent squeak that troubles the soul of the automobilist is doubtless the querulous plaint of some bearing that is athirst for lubricant.

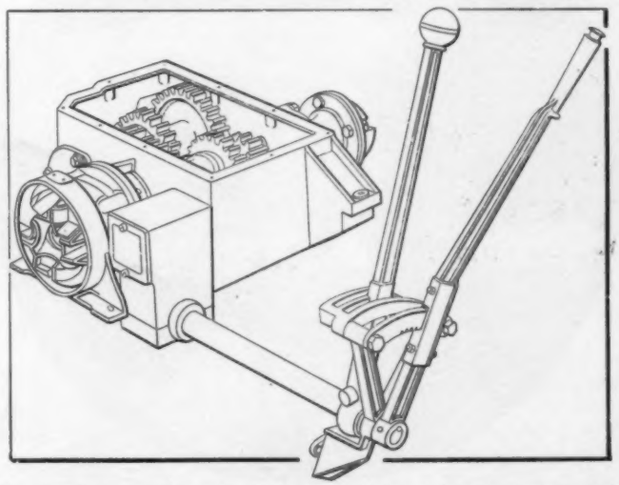


Fig. 11—General appearance of the transmission and levers and the ball-socket joint in which the front end of the propeller tube rests

A Detail that Designers Overlook

Like the poor, we always have the starting crank with us, and although self-starting devices are on the increase the old-fashioned starting apparatus has not yet been supplanted.

A GOOD deal depends upon the way that the starting handle of a car is made as to whether it will be an easy matter or not to turn the motor over for starting purposes. Preference is given by some to the short lever, and for small cars this should answer very well. But when it comes to a car of 40 horsepower, that in order to turn it at all the average driver has to have resource to the half-compression release, a long lever is preferable. The handle part, or the grip, as it might be called, has not undergone any material change from the time that the first car appeared on the road, perhaps with the exception that it is now made a permanent fitting, whereas in the olden days it was carried in the tool-box out of sight. If this part of the car's mechanism is to combine with the other parts in serving a useful purpose, the grip should be at least 5 inches long, and the part that comes in contact with the hand should be allowed to rotate freely on its axis. The mud and dust that is thrown up by the road wheels will clog the roller unless it is carried in a leather boot, and on most of the modern cars this is done. The end of the handle that is not attached to the lever should be at least 5 inches long, and on cars that require a lot of power to turn the motor over 6 inches is not too long. The end should be slightly lipped so that the hand will not slip off.

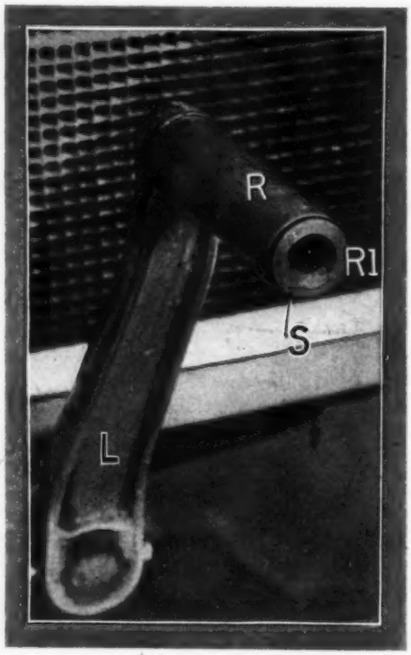


Fig. 1—Starting handle of a car showing how the roller and the rivet are related to each other

In the starting handle, shown in Fig. 1, there is an appreciable slide of the roller R and the gap at S forms a knife edge with the rivet that prevents it from slipping off. Fig. 2 shows a hand gripping the starting crank, and owing to the shortness of the handle only 3 inches thereof comes into contact with the hand. In the first place this makes it difficult to crank the motor, even were the handle made so that the operator's hand would not be injured in the operation, but in addition to this drawback the sharp edge of the rivet and the roller together pinched the flesh, and, as can be seen in the illustration, Fig. 2, the moment the handle is turned there is a certain amount of outward pressure which tends to draw the roller into tight contact with the rivet. Fig. 3 shows the operator's hand after starting the motor two or three times. This could have been avoided, of course, by the simple expedient of wearing gloves, but even then the palms of the gloves would be the sufferer and in a very short space of time they, too, would be worn out and useless. When working on a car the hands become begrimed with dirt, and this is carried into the cuts inflicted by the sharp edges. A healthy body may not be affected by this injection of extraneous matter; nevertheless, should the handle by any means be tainted with infection it will undoubtedly be transmitted through the incisions in the palm of the hand, and there is no telling where it may end. The rivet R1 in Fig. 1 is steel and in a position likely to be attacked by rust, which alone is sufficient to cause blood poisoning if allowed to get under the skin.

Simple matters, such as the one referred to, should be found out by the testing staff of any company, and a report made to the proper quarters so that the defect can be rectified and avoid owners unnecessary annoyance. The time has now arrived when designers who have been spending a good deal of labor upon the general efficiency of the car should turn their attention to detail matters. Buyers are more discriminating, and small things that tend for the greater comfort are beginning to appeal to them when they are on the point of buying a new car.

Fig. 2.—Operator in the act of starting the motor, showing how the starting handle is too short and how the roller slides over the rivet

Fig. 3.—The operator's hand after starting the motor a few times being cut by the knife-edge of the starting crank

Rotary Sleeve Valves Claim Attention

Several Types Discussed in Detail

In addition to the reciprocating sleeve valve type of motors considerable attention is being paid on the part of designers to the rotary sleeve valve. The applications are varied and numerous, but it is to be regretted that some designers overlook the effects of the explosion pressure on the valve.

IT has been the object in the present article to present to the public a diversity of types of motor other than the poppet type in order that a comparison can be made of the different lines along which designers are directing their endeavors. The Henriod and Cottereau appeared at the last Paris Salon in the form of commercialized and tried-out products, and it may be mentioned that they attracted considerable attention. It is apparent from the applications for patents that the majority of the older firms are giving the matter careful consideration, and, although no public announcement has appeared, nevertheless the testing departments are endeavoring to produce something that, besides being novel, will have the qualities of being practical and efficient. The more conservative the firm the longer will the public have to wait for the finished product.

W. J. Crossley Operates Two Rotary Sleeves in the Cylinder Head

The sectional view of the Crossley motor (AP) shows the manner in which two rotary sleeves are used to control the incoming and exhaust gases. The piston P1 connected to the crankshaft by the connecting rod C1 operates in the cylinder C2. Within the cylindrical housings, placed above the cylinder head, are two rotating sleeves A and B. Inside these sleeves there are two sleeves C and D and by the slots that are cut in these sleeves the gases pass in or out of the cylinder. The method of operating the sleeves is shown in Fig. AQ. This transverse section of the front end of the motor shows a gearwheel G1 attached to the end of the crankshaft and meshing with another gear G2 which is attached to a vertical shaft S1 rotating in guides G3, G4 and G5. End thrust is taken by the ball bearings B1 and B2. The pinion P2 is in mesh with pinions attached to a pair of the rotary sleeves, causing them to operate in opposite rotation. At the other end of the motor a similar mechanism is provided the inner sleeves D and C. The entire sleeve mechanism runs at one-fourth the crankshaft speed. In order to operate the valves in this motor it is necessary to employ ten gearwheels, which renders it somewhat complicated.

Split Rotating Ring Is Employed on the Cottereau Motor

The Cottereau motor shown in section in Fig. AR conforms to up-to-date practice in every respect with the exception of the valve mechanism. On either side of the motor the exhaust and intake manifolds are situated, and in order to cover and uncover these to permit of inlet and exhaust a cylindrical ring R1 is located in the head of the cylinder, or, in other words, the combustion chamber. The ring proper R1, and shaft S1, together with the boss B1 can be seen in Figs. AR and AT, also the slot S2 through which the gases are allowed to pass as the respective ports are uncovered. It will be noticed that the ring R1 in Fig. AT is split at A and A1, which allows for expansion. The rotary ring is operated by means of gearing G1 attached on the crankshaft to G2, whence the rotary motion is carried by the vertical shaft R2 to a gear G3 which drives the gear G4 through the intermediate pinion G5. The vertical spindle shaft S1 passes through the cylinder head, and to prevent leakage it is beveled at the point of contact with the cylinder head, which is correspondingly beveled.

Screwed on the head of the spindle S1 is a short transverse arm with a vertical stub which is received into a socket on a corresponding arm attached to a worm wheel carried on a vertical shaft. Lubrication is provided by supplying oil under pressure to an overhead oil bath lubricating the bevel and worm gearing and flowing by gravity down the hollow spindle S1 and through the hollow transverse shafts T1 driving the ring to the walls thereof.

Wridgway Uses a Spherical Valve Driven by Bevel Gearing

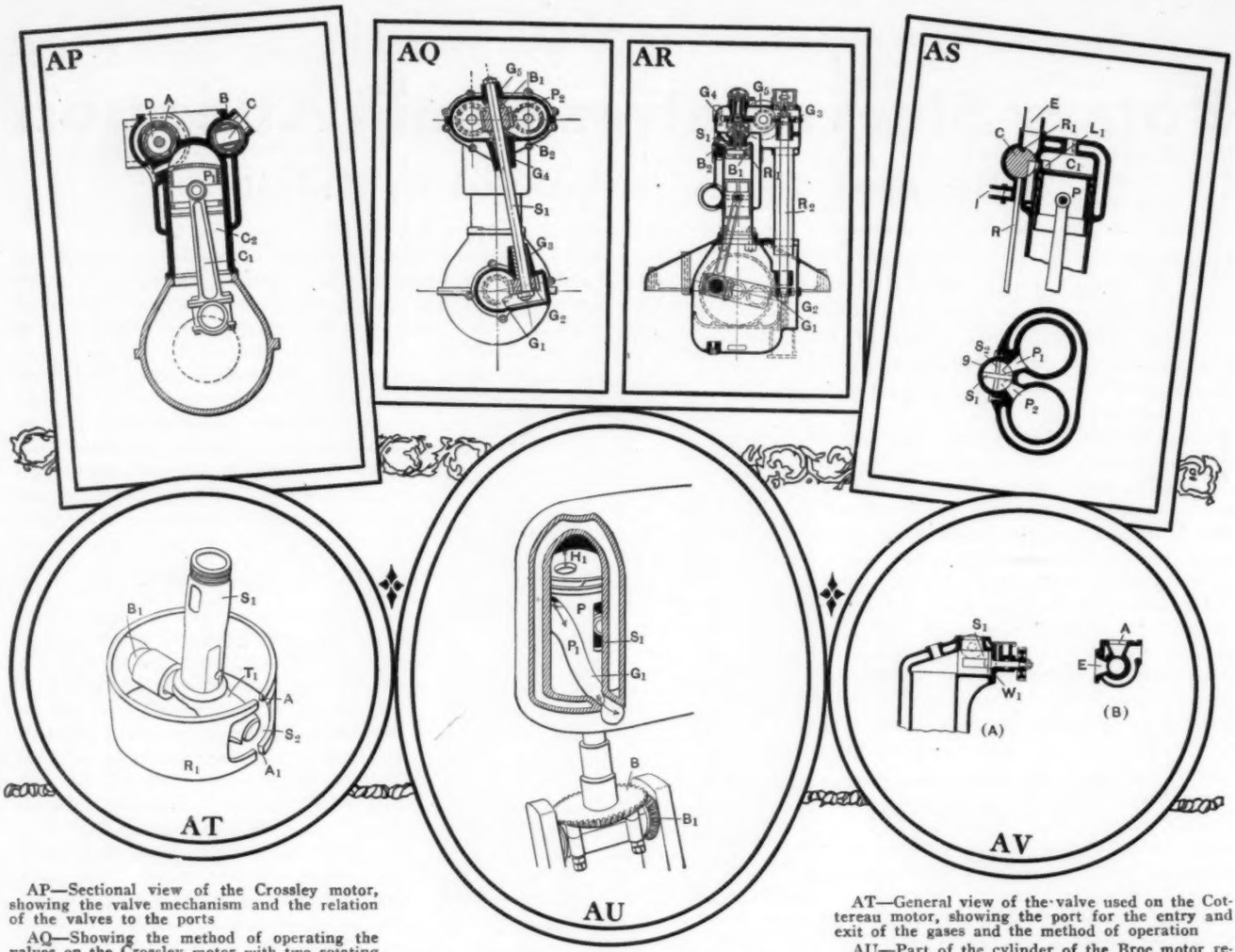
The transverse section of the motor shown in Fig. AS represents the method adopted by C. G. Wridgway and is simple in construction. The sphere C operates in such a manner as to place the intake I and the exhaust E in communication with the cylinder C1 by means of slots S1 and S2. The ports P1 and P2 in the cylinders are thus brought into communication with the intake and exhaust manifolds by the rotation of the ball S, which is operated by the rotating shaft R driven by a bevel gearing off the crankshaft, or by other suitable method. The sphere S is fitted with rings R1 and another which is not shown in the illustration, placed on the cross to prevent the leakage of the gases. The piston P has an extended lip L1 which covers the port at the moment when the explosion takes place, thereby relieving the valve mechanism of undue strain.

Broc Motor Utilizes a Double Piston Inside the Working Cylinder

The sectional diagram of the Broc valveless motor shown in Fig. AU is of novel construction. As will be seen in the illustration, there are two pistons, P and P1; the outer one P is revolved by a set of bevel gears B and B1, the latter being attached to the crankpin on the crankshaft and the inner piston driven in the ordinary way. There are two holes in the head of the inner or fixed piston, one for the intake and the other for the exhaust. In the head of the outer revolving piston there is a single hole H1 which as it uncovers the holes in the fixed piston permits the gases to be taken in or exhausted. The gases are led to their ports, by means of a helicoidal groove shown, from the carbureter to the intake port of the piston head and through it into the combustion chamber. To accommodate the angularity of the connecting rod, a slide S1 is formed in the outer piston sleeve for the reception of the fork from the sleeve on the connecting rod, by which it is actuated. The force of the explosion is taken care of by an independent mounting, thereby preventing same from being transmitted to the bevel gearing. This has to take care of the rotary strain alone. The arrows indicate the passage of the exhaust.

Swift Motor Employs a Horizontal Rotary Sleeve for Each Cylinder to Operate the Inlet and Exhaust

Fig. AV is a cross-section of the rotary sleeve motor constructed by the Swift Motor Company. The sleeve S1 alternately connects the combustion chamber with the inlet port A and the exhaust port E. The sleeve is driven with half the speed of the engine, and is water-jacketed pretty nearly all over



AP—Sectional view of the Crossley motor, showing the valve mechanism and the relation of the valves to the ports

AQ—Showing the method of operating the valves on the Crossley motor with two rotating sleeves in the cylinder head

AR—Transverse sectional view of the Cottereau motor with a split ring valve in the working cylinder

AS—Transverse sectional view of Wridgway motor in which a sphere suitably slotted is employed to control gases. Plan view shows relation of sphere to the cylinder ports

AT—General view of the valve used on the Cottereau motor, showing the port for the entry and exit of the gases and the method of operation

AU—Part of the cylinder of the Broc motor removed to show the method of operation of the two pistons employed and the passage of the gases

AV—Two sectional views of the Swift motor. A—Cylinder head. B—Valve ports

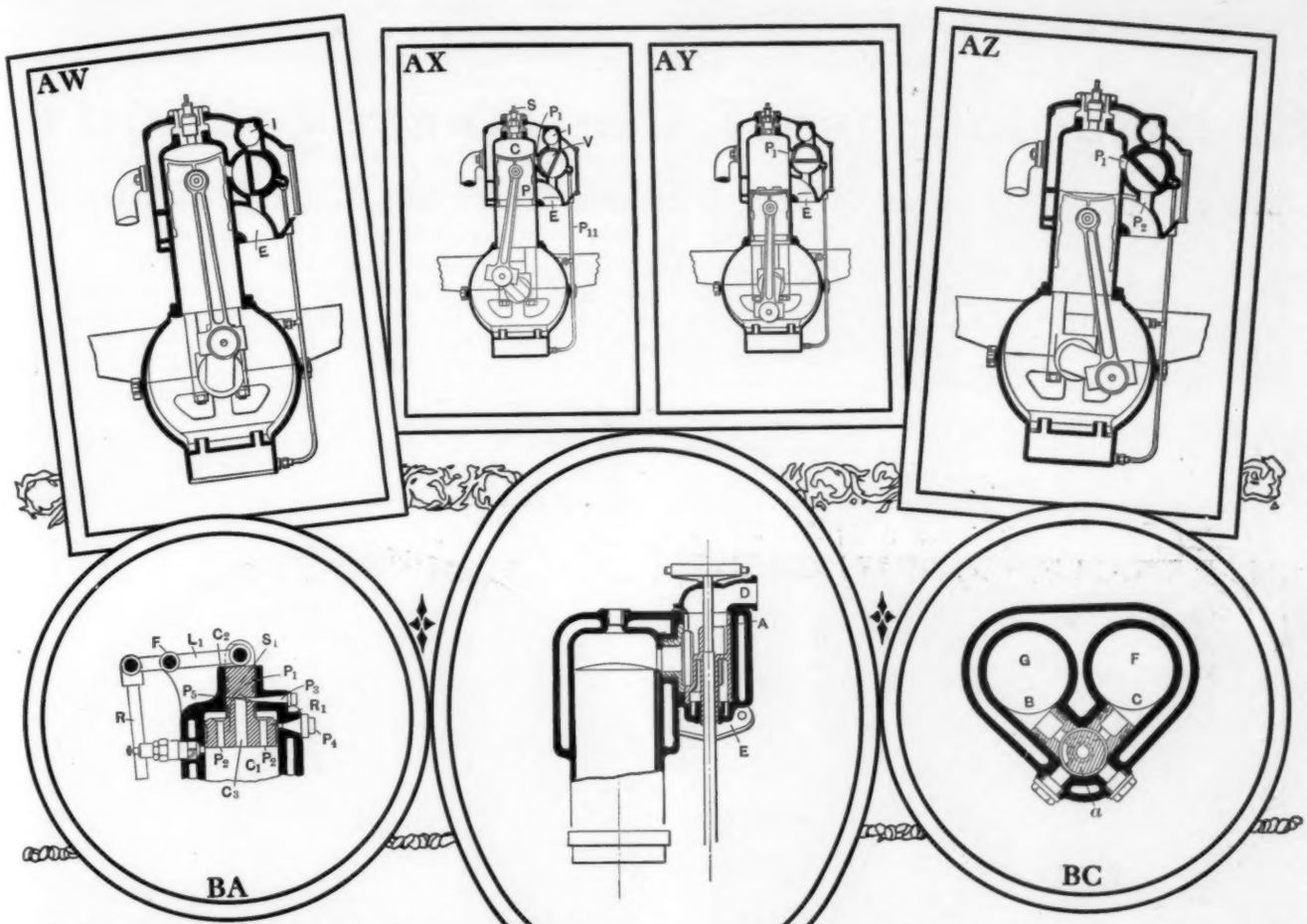
its surface. The tightness of the sleeve is not influenced by the explosive pressure, but this acts upon its back wall W1, pressing the same against the cylinder casting.

D-Form Corliss-Type Rotating Valve Is Used In the Henriod Motor

In the four sections of the Henriod motor the relative positions of the rotary valve in relation to the piston are shown. The valve V runs parallel to the cylinder C in which the piston P reciprocates. As will be seen, the water jacketing is well taken care of and the spark plug is placed in the head of the cylinder. Piston P has a concave dish, and, as shown in Fig. AX, the valve V is relieved of the explosion pressure as the piston P covers up the port hole P1, and this takes place during one inch of the stroke, which is four inches in this particular motor. Fig. AW shows the relation of the valve to the piston and the point where the exhaust has closed and the intake is about to open, the exhaust manifold being shown at E and the intake at I. Fig. AX indicates position of the valve on the firing stroke, showing the port P1 covered by the piston. Fig. AY shows the piston at the lower dead center and the exhaust port E about to be placed in communication with the port P1. Fig. AZ shows the port P1 and the port P2 giving free passageway to the exhaust gases that are being expelled by the upward sweep of the piston. The lubrication of the valve V, shown in Fig. AX, is taken care of by the pipe P11, which is in direct communication with the pressure feed system.

Richards Employs a Reciprocating Piston Inside the Working Cylinder to Operate the Valve Ports

This invention (British patent No. 28,767), registered by J. H. Richards and B. Bellingham, relates to the valve mechanism for controlling the inlet and exhaust gases of a four-stroke cycle type motor. Referring to the sectional view of this motor as shown in Fig. BA, the sliding piston P1 is employed, which is solid or undivided, having passages leading between the upper and lower faces so that it does not exert any binding or braking effect on the cylinder walls. The rod R is operated by means of a cam mechanism, a spring being interposed between the roller and secured to the rod R to maintain the tension of the roller on the cam surface. The sectional view is of the upper end of the engine cylinder C1. The piston valve P1 is fitted with a ring R1 engaging with the walls of the cylinder, and is provided upon its upper side with a central cylindrical stem S1 which passes through and is arranged to slide within the cylinder head C2, the upper end of the said extension S1 projecting above the head and being connected up to the actuating mechanism. Expansion rings are fitted to the trunk extension S1 so as to maintain a gas-tight joint. Passing through piston valve P1 there are a number of passageways P2, while upon the upper face are segments of an annular rib which, when the valve is fully lifted, comes against the under side of the cylinder head. Near the upper end of the cylinder leading to the valve space or chamber is an exhaust port P4, and an admission port P3 is provided in the upper end of the cylinder head, the inner end leading into



AW—Transverse sectional view of the Henriod rotary valve motor, showing the valve in the midway position with one port about to open

AX—Position of the valve on the Henriod motor during the compression stroke with both ports closed

AY—The piston is near the lowest point of the stroke on the Henriod motor and the valve is about to uncover the exhaust port

AZ—Position of the valve during a part of the exhaust stroke on the Henriod motor. The lubricating pipe for the valve can be seen at the right, leading from the base

BA—Sectional view through a cylinder of the Richards motor, showing how a second piston suitably drilled and slotted controls the gases

BB—Transverse sectional view of the King motor, in which a rotary sleeve valve is employed for each pair of cylinders

BC—Plan section of the King motor, showing the ports in the cylinders together with the rotary valve

the central hole in the latter, within which the valve stem S1 reciprocates. Arranged to co-operate with the inlet port P3 is a port P5 formed in the side of the valve stem which leads into the central chamber C3, passing axially through the stem and piston P1. The lever arm L1 fulcrumed at F to a lug on the cylinder head operates the piston valve. The cam that operates the rod R is so formed as to permit of periods of dwell.

King Motor with Single External Rotary Sleeve for Each Pair of Cylinders

In the King motor, a cross-section of which is shown in Fig. BB, only one rotary sleeve is provided, which serves a pair of cylinders arranged in the manner seen in Fig. BC. The sleeve, which rotates with half the crankshaft speed, is driven by means of a shaft and a set of bevel gears, and the openings B and C in the sleeve owing to their magnitude permit of rapid opening and closing of the cylinder ports, they serving to connect the inlet A and the exhaust passageway E with the respective ports of the cylinder. In Fig. BC is seen the first stage of scavenging for the cylinder F and the beginning of the suction stroke for cylinder G. An oil lead is provided alongside the sleeve.

THE trend of events points to the future better understanding of the radiator problem and to the fact that carbon is formed in the combustion chamber of the motor if the radiator fails to do its part.

Live Axle Makeshift Repair

IT is often found that the V-shaped stay under a live axle will break, and after being repaired in a short time will break again. A careful examination of the axle will disclose the fact that it is out of line and has worn the differential housing so that the axle tubes are loose in this casing.

If the axles and casing are both too thin to be turned down far enough to admit a bushing, the axle tubes may be wedged into the casing by means of strips of thin sheet steel so as to be very tight. The axle is then stiffened by means of a plank which should be 1 1-2 inches in thickness. A suitable wood for the purpose is ash. The top edge of the plank is placed along the bottom of the axle and cut to fit from end to end, the shape of the gearcase being cut from the plank to allow the plank to bear tightly against the casting. The plank is supported and held against the axle by means of four inverted U-shaped straps which hang over the axle. Slots are cut through the plank in the proper positions so as to admit cross pieces which pass through the plank. These cross plates, which are about 3-8 in. in thickness and about 1 1-2 in. in width, are drilled to take the 3-8 in. diameter straps. Bolts and lock nuts are placed on the ends of the straps and drawn tightly home. To strengthen the lower edge of the plank two flat bars of iron, 1 1-4 in width and 1-4 in. thick, may be bent to the shape of the bottom of the plank, which is sawn so as to taper toward the ends. The iron is bolted on with 1-4-in. bolts.

Shortcomings of the Average Body

Stock Bodies Are Often Uncomfortable Contraptions

As cars are sold at the present day the buyer has little opportunity to make provision for his personal comfort, and many an otherwise pleasant tour is turned into a nerve-racking trip by want of forethought in body building and equipment.

WITH the practice of selling cars fully equipped, buyers are compelled to take things just as they find them, and if they have any particular ideas of their own as to the requirements to suit their particular needs, in the majority of cases the body has to be rebuilt in order to accommodate them. There is no reason why a body should not be so built that the running boards could be denuded of tool chests, tire-carriers, and the like. The system in vogue on the Continent of selling the chassis and leaving the coach work in a measure to the buyer to decide has material advantages from the point of view of comfort afterwards; but, nevertheless, it is a good deal more costly to have a special body built than to take one of the stock models that are built by the hundred.

The advent of the fore-door has done much to render the front compartment more comfortable and the body more sightly. In the aim for comfort, some body designers overlook a pleasing aspect, whereas it should be their aim to make a combination of these two most desirable features. In Fig. 1 can be seen the method employed on the Chalmers roadster permitting the driver to enter the car on the right-hand side through a door which is made to open. This is effected by placing the levers sufficiently far forward so that they do not block the passageway. Although coach-builders may be blamed for some of the lack of comfort in the bodies that they turn out, nevertheless, if they have to build a body upon a chassis that is not suited for the purpose, the blame does not rest entirely at their door. It would be a good plan if manufacturers of cars were to take the gear-shift and brake levers into consideration, and make provision whereby the steering pillar could be raised or lowered by an adjusting device. With a fixed steering pillar, or one that necessitates the dismantling of the motor, fitting new brackets, or re-drilling the old ones, cannot be expected to suit everybody that sits behind it. The same applies to the pedals, and it is curious to see how some people will go through contortions and even body discomforts, whereas by lengthening or shortening the pedals, as the case may be, they could be made to suit the requirements of the driver.

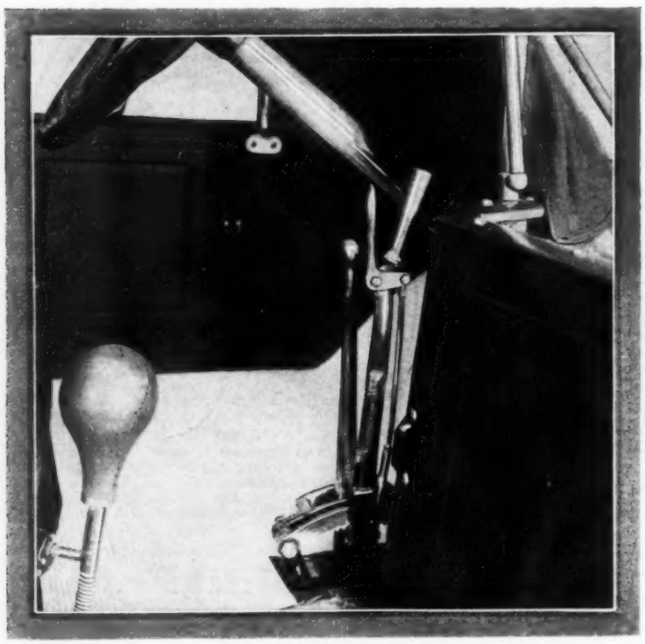


Fig. 1—Showing how side doors are made to open on the Chalmers, with levers placed so that driver can get in without disturbing passenger

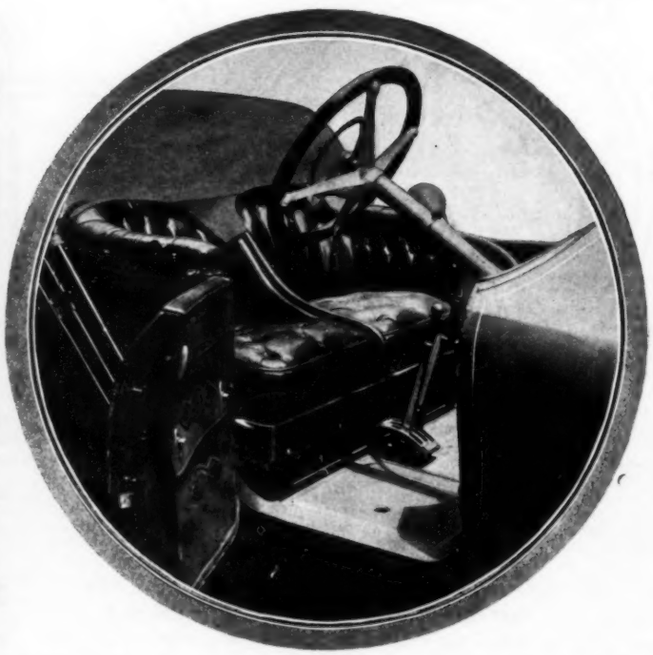


Fig. 3—Entrance to driver's seat made easy on the Overland by placing the gear and brake levers in the center

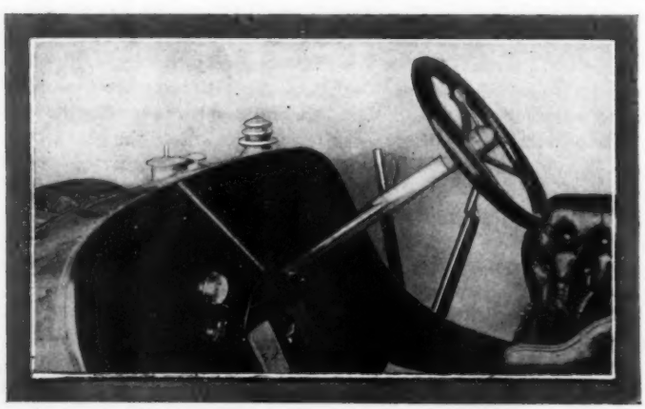


Fig. 2—Cowl of the dashboard used as a gasoline tank, with a recess cut away for the pedals, but the levers are placed very far forward

The method adopted in Fig. 2 of raking the wheel considerably, and fitting the front seats low down, tends to add comfort to a long day's drive, but in this instance when the coach-builder has endeavored to do his part of the work satisfactorily he is thwarted by the chassis-maker in so far as the levers are placed almost out of his reach. This illustration tends to show that there must be co-operation between body designer and chassis-builder. Of course the levers could be linked and bent back near the reach of the driver's hand, but after all is said and done this is only a makeshift and gives the car an unsightly appearance. What is required in this case is that the bracket carrying the levers should be given a rearward incline, and the keys that hold the levers to their shafts be reset. While studying this illustration one good point will be noticed; the dash has been left particularly free. The cowl, which is made fairly wide, has been turned into a receptacle for a capacious gasoline tank, and the side facing the occupants has been neatly finished off with a mahogany covering to which the switch and pressure gauge have been attached. The right side of the dash, as will be seen in the illustration, has been cut away, leaving plenty of leg room for the driver to operate the pedals, and instead of leaving the rubber mat below the driver's feet unprotected to the constant wear a piece of patent leather has been sewn onto this portion.

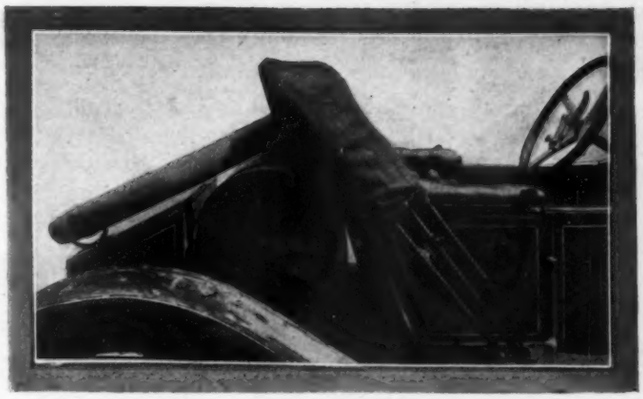


Fig. 5—Arrangement on the rear of the Overland runabout for carrying the gasoline tank, tool box and spare tire. The lowered top also improves the appearance

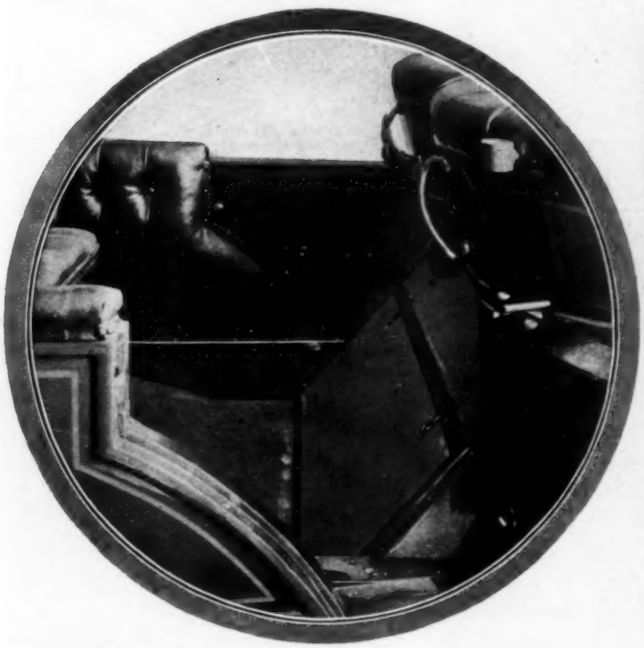


Fig. 4—Tool box and foot rest on the Speedwell car which does away with boxes on the running board and gives comfort to the passengers

A change that is taking place in chassis design, and one which gives the body builder more scope, is shown in Fig. 3. Here it will be seen that instead of placing the levers so as to be operated on the driver's right hand they are placed centrally, leaving the passageway when the door is open free for the driver to get in and out without disturbing the other passengers.

In the days when horse-drawn carriages were in vogue it was usual to have a driver and footman on the box, but now that the footman has been dispensed with in the case of the automobile and the available seats are occupied by the owner and his friends, such provision as this is a great help for the driver to get out quickly in order to open the door of the rear compartment. Runabout bodies, for the most part, offer great possibilities to the coach-builder, but the manner in which tops are fitted to this type often renders the appearance far from pleasing. The suction created by an automobile in passing through the air usually causes a back-draft with the consequence that unless the back of the car is sufficiently high dust and mud will be thrown on the backs of the passengers. By fitting a second bracket for the top, as shown in Fig. 3, the irons can be dropped, and besides being more sightly the back-draft is obviated. Reference was previously made to the question of eliminating tool-boxes from the side platform steps, and the method adopted by the Speedwell Company, as shown in Fig. 4, is worthy of notice. Considerable attention has been paid heretofore to the driver's seat and to the happy possessors of the front compartment of the car, but, beyond some refinements along the line of fittings and upholstery, the passengers in the rear of the car have been left severely alone. Anyone who has sat on the rear seats of a car has experienced the uncomfortable slipping sensation, not to say insecurity, while driving over bad roads, and this is due in a large measure to the poor foothold afforded. Immediately behind the front seats in this illustration will be noticed an inclined box capable of containing a goodly number of tools and spares, but which, when closed as shown, affords a resting place for the passengers' feet; the purchase thereby obtained adds considerably to the comfort of the occupants. One disadvantage that this brings with it will be noticed by the slightly restricted passageway, but this should be set against the comfort while driving, and, if anything, the advantage is for the latter.

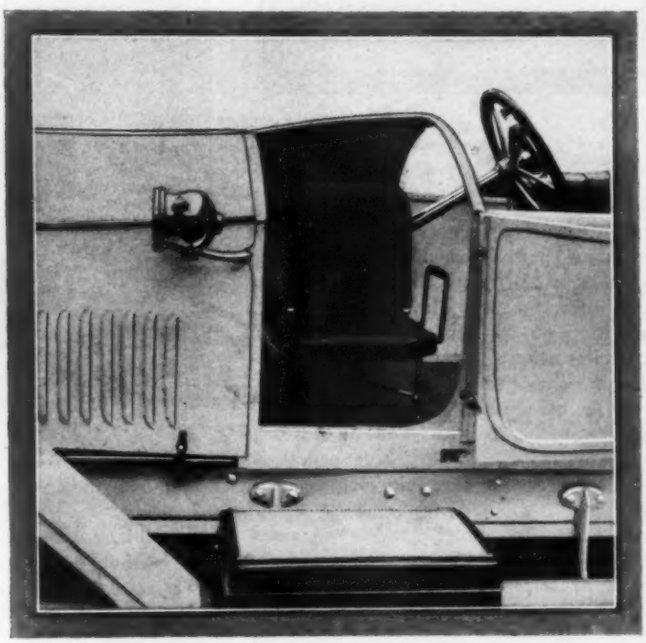


Fig. 6—Method of utilizing the waste space under the large cowl for the extra seat, which can be folded away if not required and the cowl closed

The chauffeur is a necessary evil to some autoists who either do not wish to attend to their own cars or who drive for the

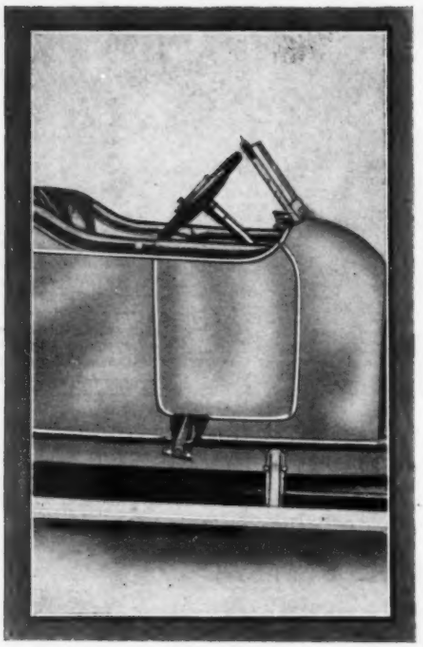


Fig. 7—Another example of utilizing the dash cowl for a gasoline tank, with the filler behind the slanting windshield

sake of driving and have not taken the trouble to master the intricacies of the mechanical parts. Then, again, there is the question of tire trouble and the owner would sooner carry a man to attend to them than do so himself. The question then arises where to put him, and the solution is either that he sit alongside of the driver or on a small dickey on the footboard. In the majority of present-day roadsters the rear of the driver's seat is occupied by a gasoline tank, luggage, and tires, which prevents the dickey being placed in this position. If the two seats are occupied by the driver and a passenger, the dickey has to be resorted to, unless some such provision is made as shown in Fig. 6. The cowl is made in two sections, one half being caused to slide under the other, and the extra seat, which can be folded and stowed away when not in use, is brought into service and the chauffeur provided with a seat in the manner shown. When the extra seat is not in use the appearance of the car is not marred by a permanent fitting, as the cowl is entirely closed in the manner previously indicated and a door is provided to complete the fore-door effect. A separate door, of course, is used to obtain entrance to the driver's seat.

The appearance of the rear of the car as shown in Fig. 5 is not at all displeasing, and the gasoline tank, tool box and spare tire are taken care of in a simple manner. This illustration also shows how this has been made possible by dropping the front ends of the top stays. Previous mention has been made to the feature of carrying the gasoline tank under the cowl of the dash, and Fig. 7 offers another example of this. The filler cap, instead of being placed in the dash proper, has been carried behind the windshield, which latter can be pushed forward while the tank is being filled. This type of front compartment is very comfortable, as the seats are placed as low as possible and the driver's head does not come above the level of the back rest. The levers in this instance are placed very low down and it has been found necessary to

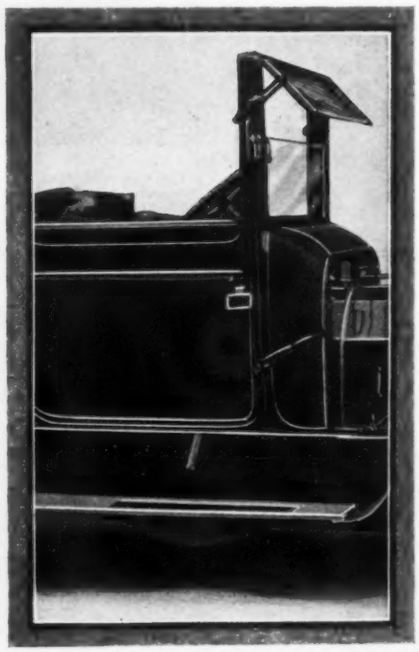


Fig. 8—Dashboard in a closed car, fitted with a glass window to permit the driver to properly see the dash fittings

break the lines of the body in order to accommodate them. A little forethought on the chassis-builder's part might have obviated this.

Now that closed cars are being used more largely, it is necessary to adopt some provision other than electric light to permit the driver to see the gauges that are placed upon the dash-board. In Fig. 8 the top part of the dash has been fitted with a glass window, allowing the light to enter and shine upon the fittings. Provision has been made in this body to permit the driver to tilt half of the glass screen forward in order to obtain a better vision on a rainy day, or to allow a passage of air into the compartment when the body is used as a closed car. Fig. 9 shows how the dash-board cowl can be extended and a windshield placed thereon just above the steering wheel, the type as shown in Fig. 8 being hinged at the top so as to swing outward from the bottom. The extension of the top is carried over the dash and under these circumstances it would be almost impossible for rain to enter. Figs. 10 and 11 show the cowl extended, the sloping bottom half being made either of leather or glass insert and capable of being laid down as shown in Fig. 10 or raised as shown in Fig. 11. It will be noticed in Fig. 11 that there are locking hinges at the top, and using these as hinges the screen can be tilted forward.

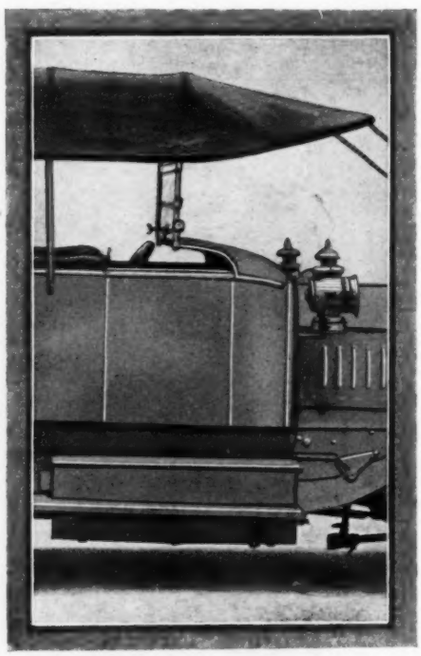


Fig. 9—Cowl extended so as to bring the windshield closer to the driver and the top given an extra extension for better protection

An extended cowl, such as is shown in Fig 12, offers some difficulty in the fitting of windshields, but this has been overcome in the manner shown. Locking devices are fitted to the base of this shield so that it can be used as a wind deflector when placed in the manner as seen in the photograph, or in a vertical position, so that the turn buttons that are screwed thereon can be attached to the extension of the top, thereby excluding all rain.

Gasoline-Electric Passenger Service

After years of experiment and disappointment with different methods of propelling the small passenger vehicle to take the place of the dirty and unsatisfactory small locomotives and cars, the "automotrice" has made a hit abroad, and seems to have come to stay. This is a car operated by electricity which is generated by a gasoline motor.

THE greatly varying conditions in Europe which confront the builder of a passenger vehicle seem, after a long struggle, to have been at last solved to a certain degree by the installation of the gasoline-electric car, generally termed "automotrice." The most notable installations have been made in Hungary, Germany, Holland and France. England and Sweden,

after having carefully watched the success of these cars in the countries in which they have already been in operation, have also placed orders for several of them.

The first experiments in the direction of self-propelled cars were made with steam motors. These proved to be very hot and uncomfortable in the summertime; the smoke and dirt present also being very annoying. The next step was in the direction of a gasoline motor-driven car. This was brought about by the great progress in the automobile, and it was expected that the gasoline motor could be adapted to the requirements of short-distance passenger traffic. The latest experiments turned toward the gasoline-electric cars, which, from the results recently achieved, give the idea that the problem has been, to a large degree, solved.

The success of the gasoline-electrics can be attributed to the following: Simplicity, due to the fact that the apparatus has been

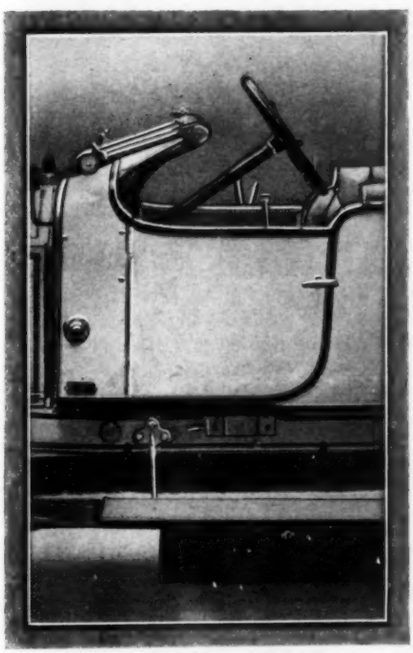


Fig. 10—Extended upswept dash with the windshield folded forward, giving the driver clear and uninterrupted vision

cut down to an elementary form, consisting of a gasoline engine, directly connected generator and secondary motors on the axles of the cars, giving a direct drive to the wheels. Reduction of weight is also a factor in the success of these cars. The modern automotrice, with a seating capacity of 40 passengers, will not weigh more than 20 tons, while an American electric car would weigh about double that amount. The power equipment of the European vehicle would be either a 60 or 90-horsepower generator group which, in a car of this weight, will give it a speed of from 25 to 40 miles per hour on level ground.

The commercial returns of the investment have ben excellent, one line showing $100,000 annual profit.

When Judgment Whispers Don't

DON'T judge a car by its reputation alone; its character should also be taken into consideration.

DON'T forget that the best set of brakes in the world are of little use unless applied at the proper time and with judgment.

DON'T fail to remember that a well-cared-for automobile is a potent illustration of the virtues of reciprocity.

DON'T forget that the monotonous regularity of a well-performing motor may be broken by the judicious application of a poor quality of lubricating oil.

DON'T overfeed the motor—dyspepsia and loud retching noises are bound to follow over-indulgence.

DON'T neglect the hour of preparation that may insure the week of touring delight.

DON'T waste sentiment upon a motor—lubricating oil may be what it needs most.

DON'T discriminate against the motor in your automobile unless you desire to be paid in kind.

DON'T forget that the product of a well-matched team is always good.

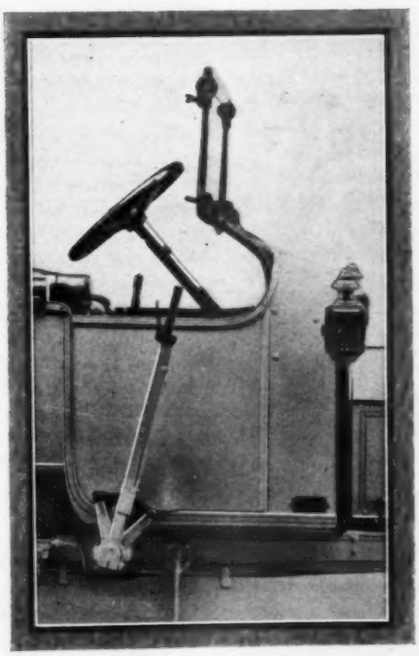


Fig. 11—Dash similar to the preceding with a windshield that offers the driver the option of opening it from the top by swinging the bottom forward

DON'T violate basic principles in building up a plan.

DON'T attempt to demonstrate the straight-line axiom when there is a telegraph pole or a wire fence in the way.

DON'T despise a horse when you can't get your car out of the mire in any other way.

DON'T forget that perfunctory preparations for a tour will surely spoil your pleasure.

DON'T look down upon the pedestrian; he may have tired of automobiling, and is waiting for his new aeroplane to be delivered.

DON'T, if you are a freight automobile salesman, dilate too enthusiastically upon the superiority of your wares over the customer's horse-drawn equipment.

DON'T allow him to hope for results unless he consents to the establishment of a well-equipped service.

DON'T forget that a failure to show results is worse than not to have made the original sale, for you have lost your future market in so far as that client is concerned.

DON'T drive the second nail until the first is clinched.

DON'T take for Gospel all that the glib salesman tells you; the salesman must "know" even if he has to fabricate.

CANADA'S CARRIAGE MAKERS TURN TO THE AUTOMOBILE—To gain a graphic idea of the growth of the automobile industry as it obtains in Canada, one needs but to take a walk among the shops formerly devoted to carriage body building. Judging by the attitude of the men who conduct these industries, it is evident that the manufacture of horse-drawn vehicles no longer affords the mechanic the same opportunity to earn his bread that it did a decade ago.

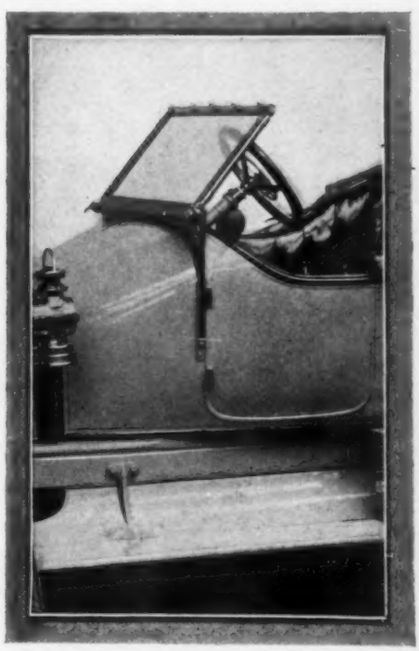


Fig. 12—Method of fitting a top to a curved cowl. The shield is fitted with a locking device whereby the position can be altered at will

Cooling and Efficiency

Suggested Improvement of Present-Day Engines

Without being specific and giving composite data to those who are looking for increased efficiency, the following article, which appeared recently in "La Technique Automobile et Aerienne," points out some of the advantages and disadvantages of present-day motors, and to improve efficiency the suggestion is given that higher compressions will furnish a solution of the problem. In dealing with the advisability of dispensing with the cooling system the author believes in sticking to the evils that we have rather than fly to others that we wot not of.

DESPITE the great amount of work that has already been accomplished, unity among the diverse types of thermic motors is far from being realized. The steam engine, contrary to the predictions that were made on the appearance of the gas motor, continues to merrily carry the handicap of 606 calories lost in vaporization.

This is reduced from time to time by increasing the compression, as well as by superheating, water-jacketing, and above all by the condenser. Its suppleness, security in operation, and easy-starting qualities, together with its reversibility, render it without doubt—at least for some time to come—a necessity for locomotives.

On the sea in the case of large ships the turbine is its only rival. But this type of motor, if it competes with the older type of piston motor, strengthens the position of steam in comparison with industrial motors of the internal combustion type. These latter, with the exception, perhaps, of specially constructed powerful motors utilizing the residual gases of the blast furnace or the coke furnace, are generally employed in installations of medium power. And even for such the steam engine is holding its own, and the recent application of the central exhaust on single-cylinder condensing engines is not favorable to the extension of explosive motors.

In several instances, however, they have a manifest superiority which is incontestable. But for aviation internal combustion motors were not indispensable, for the contrary was shown by the experiments of Ader. But they are expanding rapidly into other fields, such as submarine work, and for fishing boats, and the suggestion has even been made to equip fairly large vessels with them.

But if the two great types of thermic machines have in their own special fields a justifiable vogue, nevertheless there is a competition raging in many others. The motor that will win out in the long run will be the one that has the greatest efficiency, using this term in the broadest sense of the word, and not including in it only the question of consumption of new parts and repairs, but also the expense of running or of difficulty in keeping same in order. The author states that he is one who believes that the future holds great things in store for the explosion type motor, and endeavors to show a small side of the problem that is paramount in the minds of the industry—the search for high efficiency.

It would seem, in looking at the imperfections of the motor of the explosion type, that the greatest of these lies in the cooling problem. It is found that water absorbs some 40 per cent. of the calories that are contained in the combustible. From this alone it is seen that it is impossible to work a piston in a cylinder above a certain temperature without suffering loss of efficiency. This is subject to modification. But supposing that without modifying its general properties one were to construct a motor in which the two following conditions were obtainable, it would be said that such a motor was only theoretical:

(1) that the piston remain airtight and in good working order no matter what temperature it was called upon to work under;

(2) and at these temperatures self-ignition of the mixture was not a thing to fear—

All other properties of this motor being the same as those of an ordinary motor as at present constructed.

It ought to be pointed out in the first place that adiabatism due to the walls is hardly possible of attainment even if the exterior of the cylinder is fitted with a thick layer of heat-retaining material. It does not suffice to attain the adiabatic condition by preventing the heat from passing through the thickness of the cylinder. Another difficulty to be overcome is the prevention of the walls storing heat until a certain moment, to give it back in the next moment—a problem which is more difficult of accomplishment than the first.

Let us compare the phenomena that take place in the motor as above described with those produced in an ordinary type of motor having the same characteristics, but which is cooled. Presuming that an equal amount of combustible mixture is taken in each cycle by both motors, the pressure diagram will be slightly higher in the uncooled motor than in the other on account of the difference in the temperatures. But this advantage, although small, is perhaps completely destroyed by the detrimental action of the walls. These absorb some heat during the expansion stroke or at least at the commencement of it. They give this heat off to the burnt gases during the exhaust stroke; they heat the mixture during the suction and compression strokes—all harmful phenomena which without doubt will compensate for the small amount of gain that will be shown later. This heat that is carried off in the cooling is only utilized in a very small degree by the second type of motor. In addition the heat is carried off by the gases through the exhaust, which leave at a much higher temperature. Therefore the cooling is not a bad application in itself, because if a means were found to dispense with it, all other things being equal, the calories of the combustible could not be utilized to better advantage. It is not a question, therefore, of the losses caused by the imperfections of the mechanical working of the piston, but rather a loss of a cycle, and it is along these lines that improvement should be directed.

For that end one and only one method is available, and that is by augmenting the compression. The more the compression is augmented the lower will be the mean temperature of the gases, consequently less unused calories will be carried off by the water. Diesel takes advantage of this phenomenon and proposes a motor with high compression without cooling. The kerosene motors that he has turned out so far are an experimental proof. These lose to the cooling water per horsepower hour about one-third of what is lost in the same manner by ordinary explosion motors with much lower compressions. Whereas these types rarely ever attain a 25 per cent. efficiency, the Diesel often betters 35 per cent. for large power plants. On the other hand, if the simple augmentation of the compression permits this important loss to be minimized, as we have just seen, it is useless to pass from the cooling to some other manner, because there would not be any economic advantage. It would seem to be a relatively easy matter to imagine some mechanical disposition that would permit a piston to work in a cylinder under high temperatures, and it is proposed

to return to this later. But, as we have just seen, the solution of such a problem is void of interest.

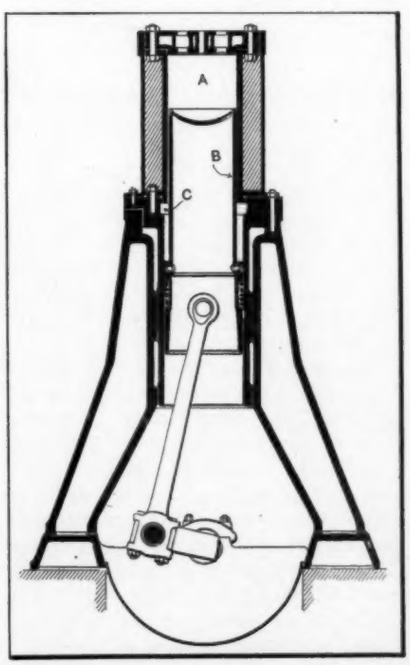
No matter from what side the question is viewed, it will be necessary for those who wish to build internal combustion motors of great efficiency to follow the ordinary practice in the employment of high compressions. It will be impossible to use the "explosion" motor above certain limits, the degrees of which will depend on the weakness of the mixture, on account of self-ignition. Then the Diesel type of four-cycle motor for liquid or pulverized combustibles will be used, or the Gardie type of two-cycle for gaseous combustibles or even for the others.

The Gardie motor is to the gas variety what the Diesel is to the kerosene. It is to be regretted that the trials of this type of motor were not carried out further, as no doubt it would have given excellent results. Unfortunately the few tests that were made were only with compressions that seem very low at the present day. Such a motor is perforce fairly complicated, and is not interesting for that reason.

The growth of compression must have a limit, and in order to understand this one has only to think for a moment of the inconveniences that would be engendered by an exaggeration. All the working parts would have great strains to support and would have to be reinforced. A piston submitted to excessive pressures rapidly renders the cylinder walls oval; it would be difficult to overcome this by lengthening the connecting rod because it would soon become formidable.

If the price of a machine for a given power varies in an inverse ratio with the efficiency; a limit would soon be attained above which there would be little use in going. On the other hand, the interest presented by the increase of efficiency lessens as this increases. An augmentation from 10 to 15 per cent. will furnish an economy on the combustible primarily employed of one-third, whereas if the machine already has a 25 per cent. efficiency and by bringing this up to 30 per cent. one would economize more than one-sixth of the primary combustible. It will be noticed that this is less than in the first case cited, on account of better efficiency, and it shows that the absolute economy realized in passing from 25 to 30 per cent. is not more than one-fifth of what can be obtained in passing from 10 to 15 per cent.

This is why one would stop short in the research for high efficiency much below the figures of the Carnot cycle. And when all motors have attained a sufficiently high efficiency for the purpose for which they are intended, the industrial choice will no longer be guided by matters which seem almost of secondary importance in certain cases, such as simplicity, regularity in running, cost price, durability, and so on, although such considerations have a good deal more importance than some people attach to them. Now to deal with the subject previously referred to, viz., the working of a piston in a cylinder of an uncooled internal combustion motor. According to the author, there should be no difficulty in obtaining such a condition. It would not be possible to retain the type of piston that slides easily in the cylinder. One could employ a piston similar to that shown in the accompanying illustration, with a diameter slightly less than the cylinder, without any point of contact between the two members.



Sectional view of a motor referred to in which a double piston and cylinder are employed in order to obtain a piston that will operate in a cylinder at high temperatures.

By this means we would have a second piston and a second cylinder forming part of the main cylinder and joined thereto. It works at low temperatures because between the hot part of the motor A and the lubricated piston there is an annular body of gas B which will prevent the heat from being transmitted. It remains to provide that these gases shall not be in constant motion, and this can be arranged by calculating the different diameters and the volume in the space C so that the pressures at A and C shall remain practically constant. Cold air could be injected at C which would prevent the piston as well as the airtight cylinder from heating.

This principle has been employed by different inventors, among whom may be mentioned Gardée. It may be noticed that a large number of inventors set themselves to the task of solving oftentimes arduous problems without perceiving that there will be little utility gained thereby. The preceding example is among this class; nevertheless it might be worthy of consideration in the case of pulverized combustibles. But that time has not yet arrived.

Changes in Thermal Efficiency

The products of the exhaust form the greatest clue to the thermal efficiency of the motor. These products change under different load conditions and for this reason the thermal efficiencies vary with the load.

FOR a given motor there will be a certain load at which the combustion in the cylinder will be most complete and the exhaust will contain the minimum amount of combustible material. The greatest heat value will be obtained from the fuel when the greatest amount of carbon monoxide has been burned to carbon dioxide and the greatest amount of hydrogen has been consumed. Hence the presence of an excess amount of carbon monoxide and free hydrogen in the exhaust shows that the motor is working at a low thermal efficiency.

Taking an average case it will be seen that under full load the amount of carbon monoxide present will be 3.31 per cent. of the total volume of all the exhaust gases and the hydrogen 1.19 per cent., while with part load the carbon monoxide was 6.9 per cent. and the hydrogen 2.4 per cent. The free oxygen in both cases was very nearly the same, figuring on a percentage basis showing that under all conditions an excess of oxygen above the theoretical amount necessary to combine with the fuel is required. It is impossible under the conditions we are at present working to secure what might be called a perfect exhaust, that is, an exhaust in which there will be no trace of uncombined fuel, but there is a field here for the designer to raise the thermal efficiency of the modern engine by a partial removal of this source of loss. The other heat losses seem to be a necessity since we cannot dispense with a cooling agent of some sort, nor can we have a bearing in which there is not some loss due to the heat of friction. There is a load condition, however, under which the loss due to unburned gases in the exhaust will be a minimum and the thermal efficiency a maximum. The conclusion to be drawn from the fact that working under a reduced load is working with reduced efficiency points out the bad economy of overpowered plants.

SOME of the German tire manufacturers give a guarantee on tires "for 10,000 kilometers, to be run within twelve months from the date of delivery," under conditions which restrict the heft of loads.

Removing and Replacing Piston Rings

Editor THE AUTOMOBILE:

[2,761]—I intend to take the piston rings from my motor and clean them. Before starting to work, however, I would like to have full and detailed information as to how to go about removing the rings and returning them to their proper positions in the piston. If you could supply me with the desired information I should be very much obliged. I wish to start upon the work at once and would appreciate an early reply through your columns or by mail. A. W. SCHEDE.

Islip, N. Y.

There are several good methods in vogue to remove the piston rings without doing them any damage. One of the best and most practical ways is to take a piece of stiff copper wire flattened at one end and insert it beneath the ring at the cut. The ring is then pried up by means of the wire until it is lifted clear of the groove. A piece of brass about one-half inch in width and two inches in length is slipped beneath the ring, thus forming a bridge across the groove. The accompanying cut, Fig. 1, shows the first strip of brass inserted. Other strips are inserted in the same manner all around the ring, which can then be slipped off the end of the piston.

The rings are replaced in the same manner, the order of procedure, of course, being directly opposite to that of the removal of the rings, care being taken to put the rings back into their proper positions and not to bend them too far, as they are brittle and easily broken.

Trying to Blow Up the Muffler

Editor THE AUTOMOBILE:

[2,762]—As I am a constant reader of your paper I am taking the liberty to ask your advice on the best way to go about curing the trouble to which my motor is greatly addicted. Every once in a while a series of explosions will take place in the exhaust pipe and muffler as if the engine were doing its best to put the muffler out of commission. I should like to know what the causes of these muffler explosions are and if they are dangerous? K. M. KARCHER.

Portsmouth, N. H.

Explosions in the muffler are in every case due to the presence of unburned gases which have passed through the exhaust pipe owing to misfires in one or more cylinders. The unburned gases pass through the exhaust line into the muffler and are ignited by incandescent particles of carbon or metal or by the heat of the exhaust of the next explosion in the cylinder. These explosions are not as a rule dangerous as far as bursting the piping is concerned, but in an enclosed garage where there is gasoline vapor in the air, they may be the cause of starting a serious fire.

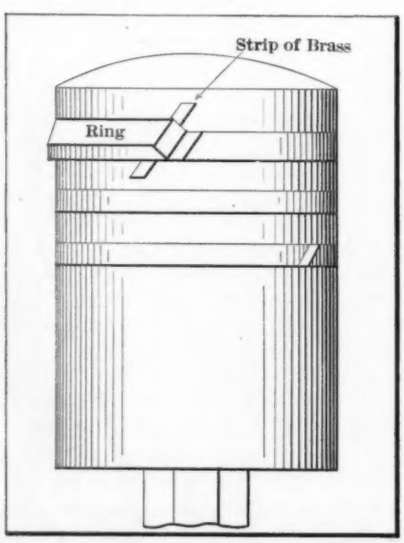


Fig. 1—Showing strip of brass inserted under piston ring in order to slip the ring off the piston

What Some Subscribers Want to Know

The Editor invites owners and drivers of automobiles who are subscribers to THE AUTOMOBILE to communicate their automobile troubles, stating them briefly, on one side of the paper only, giving as clear a diagnosis as possible in each case, and a sketch, even though it may be rough, for the purpose of aiding the Editor to understand the nature of the difficulty. Each letter will be answered in these columns in the order of its receipt. The name and address of the subscriber must be given, as evidence of good faith.

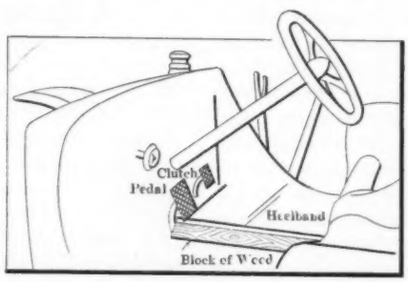


Fig. 2—Method of blocking back pedal while repairing the clutch

A Trip to the Repairman Necessary

Editor THE AUTOMOBILE:

[2,763]—I am very much bothered by the cooling water boiling in the radiator and by back firing while running slowly. Would you kindly tell me if these have any bearing on each other and how they may be prevented. OLD SUBSCRIBER.

Bath, Me.

There is no doubt something wrong in the water circulating system which is responsible for all the trouble. Through not being sufficiently cooled the combustion chamber becomes over-heated and causes pre-ignition, and the backfiring is directly traceable to this.

In Trouble with a Biting Cone Clutch

Editor THE AUTOMOBILE:

[2,764]—I am having a great deal of trouble with the clutch on my car. When I close the clutch gradually it will suddenly seize or bite. It is a cone friction clutch, leather-faced, and has given trouble for some time, although before that it worked perfectly well under all conditions. I would be greatly obliged for any information you could give me as to what the cause of this difficulty may be and how it can be best remedied.

Denver, Col. CHAS. JENKINS.

The clutch pedal should be blocked back as shown in Fig. 2, so that it can be easily examined and the work done to good advantage. If dry, the leather should be soaked with castor oil or neat's foot oil, distributed evenly over the surface. Work the clutch pedal back and forth a few times after the oil has been applied and then block it open and leave it in this condition for about a day.

If the clutch is very oily a good grade of fuller's earth with all grit removed may be employed to absorb it.

Making Preparations for a Long Tour

Editor THE AUTOMOBILE:

[2,765]—I have two Cole model H roadsters, year 1910, 4 x 4 engine. The Cole people state that they have no instruction book covering this type of car and I understand that they have ceased making it. Therefore, I beg to ask of you the following information:

The gears driving the magneto are at the front end of the engine in a case by themselves. This compartment is separated from the crankcase by a felt lining which I can make reasonably tight. Please advise if it is well to fill this compartment full of non-flowing oil or grease or should the regular light cylinder oil be used? There is not much lost motion in these gears, but they make a little noise.

The oiling system of the Cole, as you know, consists of a reservoir in the bottom of the crankcase from which the oil is pumped into two pans. The cranks then take it up. There is a petcock in this pump

What Other Subscribers Have to Say

The Editor invites owners and drivers of automobiles who are subscribers to THE AUTOMOBILE to communicate their personal experiences for publication in these columns for the worthy purpose of aiding brother automobilists who may be in need of just the information that this process will afford. Communications should be brief, on one side of the paper only, and clearly put, including a rough sketch when it is possible to do so, and the name and address of the writer should be given as evidence of good faith.

which I do not know the use of. It seems to be placed there for the purpose of determining if the pump is working properly. No oil comes out whether it is turned on or off. It may be possible that when this cock is opened air will be admitted to the pump, thereby lessening the flow of oil. Therefore the petcock may be for the purpose of regulating the amount of oil drawn up from the supply. Kindly advise if this is so.

This car is equipped with a leather-faced cone clutch. Please advise proper treatment and oil to use on this clutch.

The transmission gears are in a casing, oil-tight. They are the usual sliding gear type. This case does not leak oil into the clutch compartment, therefore please advise whether light oil or heavy grease is the best to use.

One of the front wheels has been dished by striking something at high speed. The rim normally is flared outward, but since this accident the entire rim is dished inward. Please advise how this may be repaired.

I am preparing this car for a 1,000-mile tour and would greatly appreciate the information. H. R. VAN DEVENTER.

Sumter, S. C.

The gearcase should be packed with a good quality non-fluid oil. The petcock on the crankcase is for overflow in case the oil level is too high, and the reason that you have not had a flow from the cock is probably owing to the fact that the oil level in the crankcase has not been above normal.

The leather-faced cone clutch should be washed with kerosene and castor or neat's foot oil applied. The transmission is packed in a mixture of oil and grease.

If the wheel is much "out of true" perpendicularly, get a new steering knuckle; if horizontally, the adjustment may be made by taking up on the tie rod. For horizontal adjustment the distance between the two wheels at the front and back should tally; for vertical, jack the car up and spin the wheel. If there is an excessive "wobble," the steering knuckle should be renewed. The best thing to do is to let a competent wheelwright examine the wheel.

Not Necessary to Tear the Car Apart

Editor THE AUTOMOBILE:

[2,766]—Would it be asking too much of your engineers to solve a problem for me? I have a small Olds runabout, model "R," single cylinder, made in 1903. If you have anyone who is familiar with this type could they tell me how to put a new wrist pin and bushing in the motor without having to tear the whole car down?

Washington, D. C. J. L. HINES.

Remove the body from the car, take off the front end of the crankcase, unfasten the connecting rod from the crankshaft and draw out the piston. The repairs can then be easily made.

Charging Storage Batteries from Light Circuit

Editor THE AUTOMOBILE:

[2,767]—Will you please give a diagram and instruction for charging storage batteries from an electric-light circuit which is continuous. T. W. L.

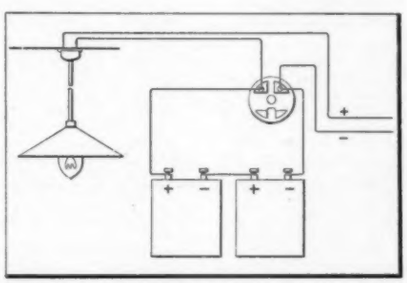


Fig. 3—Wiring diagram showing method of charging storage battery from electric light circuit

Trenton, N. J.

From the switch that controls the lights run two wires as indicated in Fig. 3. After testing which is positive and which is negative, mark the wires in some suitable manner for future use. In order to carry out this test obtain a weak solution of acid or salt water, and after baring the ends of the wires place them in the solution so that they do not touch and it will be seen that bubbles flow from the negative wire. The wires can then be connected to the battery, but care should be taken that the switch is in the off position.

Gear Shift Lever Works Loose

Editor THE AUTOMOBILE:

[2,768]—While driving recently and changing speed the gear shift lever of my car became loose on the shaft, and although it was not bad enough to prevent my getting home, nevertheless I do not feel confident in driving the car until I have it fixed. The shaft is cylindrical and the end of the shaft that passes over the tube is not a very good fit, the two being held together my means of set screws. I should be obliged if you could give me a sketch of a better method of fixing these parts so that my present trouble will not occur again. ARTHUR T.

Philadelphia.

There is very little advantage gained in having this shaft made of tubing and we suggest that the present shaft be replaced by a solid shaft with the end to which the lever is attached finished off in a square in the manner shown in Fig. 4. If the lever is filed in the manner shown and firmly locked with a bolt and nut you need never fear that the lever will shift or work loose. The shaft will have to be slotted in order to accommodate the bolt, but this will strengthen matters and is another means of preventing rotation.

Desires French Automobile Literature

Editor THE AUTOMOBILE:

[2,769]—As I am a reader of your paper I take the liberty to ask a few questions. Where or How may I secure some catalogues of the best known French one-cylinder automobiles or some French and English automobile magazines? I would like to get a catalogue of the one-cylinder racing type Mercedes. C. T. FREDERICK.

Norwalk, Ohio.

The catalogues of the different cars may be had by addressing the manufacturers, who will gladly supply them. The Mercedes car is made in Germany and these people do not manufacture a type such as you describe. An English magazine is the "Autocar," published in Coventry, England, and a French magazine, which may contain the names of the manufacturers desired, is "La Vie Automobile," published in Paris, France.

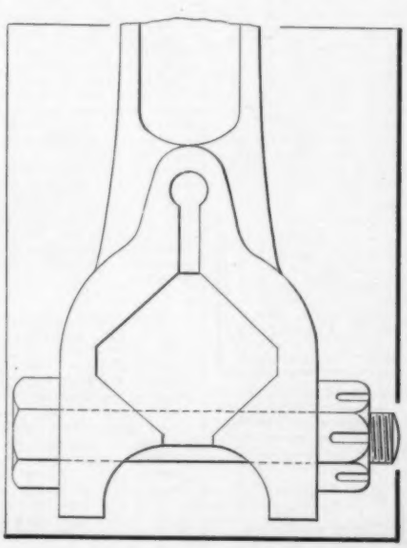


Fig. 4—Method of attaching gear or brake lever so that it will not slip on the shaft

Meeting Recurring Troubles

Presenting a Series of the Most Probable Cases

A series of co-related short stories, accompanied by diagrams and characteristic illustrations, indicating the nature of the troubles that are most likely to happen to automobiles, discussing their causes and effects, all for the purpose of arriving at a remedy. It is the aim, for the most part, to show how these troubles may be permanently remedied, and as a secondary enterprise it is indicated how the automobilist can make a temporary repair, thereby enabling him to defer the making of a permanent repair until a convenient time arrives.

MAGNETO REPAIRING A DIFFICULT UNDERTAKING FOR THE AMATEUR—For the average automobilist who undertakes to repair his own magneto failure is spelled in large letters just about the time he starts on the undertaking. Aimless tinkering never has repaired a deranged magneto, but it has hopelessly ruined many.

If an ordinary bar magnet is placed on a table the magnetic lines of force are constantly flowing from the north pole of the magnet to the south pole. These lines of magnetic force vary in intensity according to the distance from the magnet, and follow the lines shown in the accompanying illustration (Fig. 1). Electric force is generated when the magnetic flow from pole to pole in the magnet is interrupted, and this is the first principle of the magneto. The ordinary magneto consists of two permanent magnet poles arranged in the form of a horseshoe, the ends of the legs of the horseshoe being the two poles of the magnet. The magnetic current runs between these two poles across the gap which separates them. In this gap is placed the armature as illustrated in Fig. 2, where N is the north pole and S the south pole, the armature coil being shown between the two poles. The armature coil is wound about this core and the ends of the wire terminate in the commutator of the magneto.

If a wire is placed between the two poles of the magnet and rotated as is depicted in Fig 3, a current of electricity will be induced in the wire which will have a direction of flow directly opposite to the flow of the magnetic current. As the wire rotates the current will start to flow through the wire in the direction shown by the arrows in the cut. When the wire has turned through one-half of a complete revolution the part which was near the north pole of the magnet will now be near the south pole and the current in the wire, since it is opposite always in direction to the magnetic flow, will be reversed. Since this current is reversed on each revolution it stands to reason that there must be some neutral point just before the reversal where there will be no current passing through the coil. This point is at the spot where the coil is horizontal. The flow of the current may be set out diagramatically as in Fig. 4, the horizontal line being the zero line of no current and the sine curve showing the fluctuations of the current with the change in position of the armature. Three positions of the coil are shown in Figs. 5, 6, 7. These are the positions of maximum current, mean current and no current.

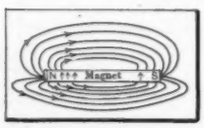


Fig. 1—Illustrating the flow of the magnetic current through a bar magnet

It can be seen that if the core had 2 axes instead of one these current impulses would be more frequent, or, rather, since the windings would be independent, the impulses would overlap each other and give a smoother flow.

The brushes on the armature pick up the current from the coil and carry it to the binding posts of the magneto, whence it is carried by the wiring scheme of the car and distributed to the various points in the system.

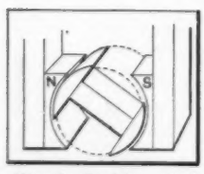


Fig. 2—Position of the armature between the magnets of the magneto, showing direction of rotation

FUEL DIVISION USUALLY TOO COARSE.—In the coarseness of the fuel division lie the chief failures of the typical carbureter. This has been proven again and again by a great many experimenters. Those who have constructed transparent mixing chambers for the observance of nozzle action have invariably found that the fuel left the nozzles as a solid stream or in heavy globules and irregular "chunks," not as a fine spray or mist, as it is supposed to do. Improved design and workmanship on the nozzle or needle valve parts will almost entirely overcome this poor action, with an increase in power output and fuel economy; but any nozzle form used will give a wet and sloppy discharge with low engine demands, even though a true spray may be delivered with increased demands.

Whatever form is given the nozzle, the effectiveness with which it can break up the fuel varies as the difference between the pressures at its two ends, and, as this pressure difference varies throughout the speed range of the engine, the fineness will also vary. At high-speed engine demands the spray will be better and finer than at low; but this is absolutely necessary, since the time allowance for vaporization is less and the quantity of mixture formed is greater.

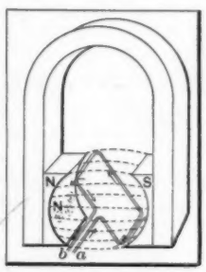


Fig. 3—Showing how the electric current is induced in a magneto coil

The nozzle of average performance will, at medium engine demands, deliver a thin, conical sheet of liquid. This liquid cone is torn away at its edge and carried on by the air column. Some of the fuel torn away is in small enough particles to be considered as spray or mist, and may be taken as contributing directly to the vapor content of the mixture; but the greater part sooner or later strikes some part of the containing walls, from which it is later picked up in the form of globules. These globules are continually picked up and thrown out by the air stream in its progress to the cylinders, until some of them are sufficiently small to become permanently entrained or have been completely vaporized.

Bends in the manifold passages aggravate the expulsion of the liquid globules, but they also permit of fuel once thrown out being readily picked up again. The persistence of rectilinear motion comes into play and throws out the heavier globules at the turns, they being again picked up by a following portion of the air column. This action is repeated at each turn of the mixture lead.

In the foregoing it may seem that the vaporization accomplished by pressure reduction has been placed on a par with that brought about by the heat supply available in the air and passage walls. It is not meant that such an impression be taken. The rate of transfer of heat from the air and walls to the liquid will, of course, be the higher the greater the temperature difference; the lowering of the pressure lowers the temperature of the liquid through partial vaporization, and thus increases the temperature difference. Thus, while vaporization could not go on at a proper rate without such a heat supply, the lowered pressure under which vaporization takes place is an important adjunct, second only to the heat supply.

Fig. 4—Diagram showing the fluctuations of an alternating current

DISTINCTION IN VAPORIZATION OF HYDROCARBONS.—Vaporization due to pressure reduction is distinguished from vaporization caused by the supplying of heat. In the former action vaporization can become only partially complete, however far the process of reduction is carried, since the part of the liquid which vaporizes does so through the abstraction of heat from the remainder, which becomes constantly colder, until finally the temperature of the liquid is so low that vaporization ceases until heat is supplied from some outside source. Where vaporization is brought about entirely by heat from some outside source the degree to which it may be carried depends wholly upon the amount of heat supplied, since the temperature of the liquid is being constantly raised to or maintained at the proper point.

In the carbureting device under consideration neither of the above processes is carried to the limit, nor goes forward alone and unmodified. They are called into action simultaneously. The reduced pressure due to motor suction causes vaporization with a lowering of the temperature, and the heat of the air tends to cause vaporization through a transfer of heat from itself to the liquid. Thus it appears that each of these vaporizing actions assists the other—the air supplying heat to the liquid as it is cooled by vaporization under reduced pressure, and the reduction in temperature due to pressure reduction facilitating the transfer of heat from the air to the liquid.

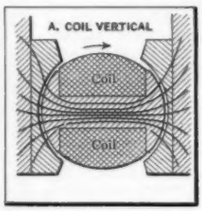


Fig. 5—Magnetic flow with coil vertical. Electrical current at a maximum

Within the temperature and pressure ranges available, the liquid must present, relatively, an enormous surface to the air if vaporization is to be sufficiently rapid. To this end the passage through which the liquid flows is so formed that the liquid is broken up into a spray by the velocity of its effluxion due to the difference between the pressures existing at the two ends of the passage.

In any one carbureter the perfection of vaporization is proportioned to the fineness with which the liquid is broken up at the nozzle. The shortness of the time within which vaporization must be completed is what causes the above factor of fineness of division to enter. Since the heat transfer between the air and the liquid, or the passage walls and the liquid, is effected chiefly through the agencies of convection and conduction—the former implying a rapid agitation and relative motion between the particles of the two substances, and the latter the exposure by the liquid of the greatest possible surface areas—it is readily seen that the finer the fuel division at the nozzle the more rapid and complete will be the vaporization and the greater the homogeneity of the final mixture.

HEATING USUALLY NECESSARY TO VAPORIZE GASOLINE.—If the nozzle and the conditions under which it operates are such that a true mist-like spray is delivered into the air column, no recourse need be had to air or wall heating devices providing the temperature of the air is 60° F. or higher. But, since such conditions very rarely obtain in practice, the expedient of heated air or jacketed mixing chamber walls must often be resorted to.

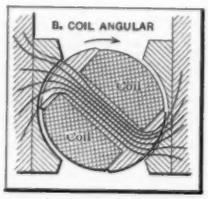


Fig. 6—Magngetic flow with coil oblique. Mean electric potentiality

Because all liquid hydrocarbon fuels are variable and unstable, both in their chemical compositions and physical characteristics, it is very difficult to formulate their actions or determine the best conditions under which to utilize them. Experimental data are placed at an equal disadvantage with mathematical and theoretical analyses in that the exactitude of either method is impaired by the non-uniformity of the substance. However, serviceable figures are entirely within reason; and as such the writer submits the following:

The hydrocarbon known as motor gasoline, specific gravity between .70 and .73, is a mixture of individual substances, each combining carbon (C) and hydrogen (H) in varying proportions. A small percentage of oxygen (O) is often present (never to exceed 3.5 per cent.), but, because of its smallness and sometimes total absence, it will be neglected. The several substances composing gasoline are all of the methane series, the chemical formula for which is expressed $C_n H_{2n+2}$. This means that for the entire series, which comprises some eighteen substances, each combines C and H in the proportion of twice as many atoms plus two of H as there are atoms of C.

The first member of the series present in gasoline, pentane, C_5H_{12}, has a specific gravity of .626; the last member, decane, $C_{10}H_{22}$, has a specific gravity of .736. The other members between these two have specific gravities ranging between the two values given and corresponding to their increasing molecular weights. The second member of the series, hexane, C_6H_{14}, is the representative constituent of gasoline, being present in greater quantities than any of the others. Traces of pentane or the members beyond nonane, C_9H_{20}, specific gravity .723, are seldom found in gasoline. Thus, hexane, though much lighter and more readily vaporized than the several heavier members occurring with it, should be used as the basis for any calculations. This use is justified by the high vapor pressure of hexane, as will be explained later.

LOSS OF POWER ABOVE 1800 REVOLUTIONS PER MINUTE.—A motor does not necessarily lose

power over 1800 revolutions per minute, as there are several motors that give maximum power at speeds well over 2000 revolutions, and some over 2500 revolutions per minute. The maximum speed of an engine is governed by the setting of the valves and the size of the valve seat and outlet ports; as an example, one of the small cars with a 4-inch bore had three exhaust valves to its one cylinder. On engine speed curves of some motors the falling off of power indicated by the falling line is due to the fact that the speed is too great to allow the charges to be either properly gotten to the cylinders, weakness of mixture, or back pressure of the exhaust. It is supposed that the ignition is correct, although, while it is possible to obtain instruments to fire at, say, 3000 revolutions per minute, some do not give satisfactory results above a certain speed, and this can only be determined by trying out several different makes.

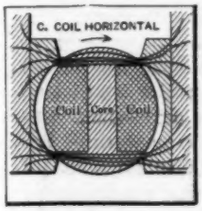


Fig. 7—Magnetic flow with coil horizontal. Zero electric current

DIFFERENCE BETWEEN 2-CYCLE AND 4-CYCLE ENGINES.—In the 4-cycle motor there is one power stroke in each four strokes; there are two strokes per revolution of the crankshaft; valves are used to regulate the inflow and exhaust. In the 2-cycle motor there is a power stroke for each two strokes, and ports are so placed as to admit the mixture and permit exhaust on each down stroke of the piston.

TOOLS FOR REPAIR IN PRIVATE GARAGE.—To the man who likes to keep his own repair shop as well as to run his own car a well-equipped garage is a necessity. Several of the tools to be found in a garage in which the machines are repaired as well as stored are shown in the accompanying illustrations. A small anvil, while not as generally used as the great usefulness of the tool would seem to indicate, will be found on many occasions to be of great use. The anvil is designed to fill the position of a base plate where any hammering on hard metal is to be done. Besides being a mere foundation plate its shape enables it to be used for a bending slab in cases where it is desired to put either a sharp corner on a piece of metal or to fit a part in place by changing the curvature.

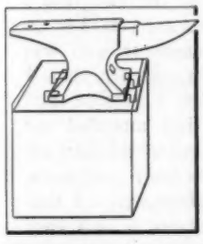


Fig. 8—Usual type of anvil mounted on heavy block and clamped tightly to base to reduce vibration to a minimum

The uses of a vise are so many that it will probably be the first thing that the owner of a machine will find himself in need of if he contemplates doing his own repairing. It is indispensable even for temporary repairs. It would probably be well to have a small and a large vise for different classes of work in a garage that aims to be well equipped for repair work. In connection with the vise a useful part is a pipe bushing which may be inserted when it is desired to thread the pipe or to work it into the desired shape or length. This bushing is fitted with teeth which hold the pipe and do not dent it. The vise can be tilted to any angle at which it is convenient to work, so that when combined with the pipe bushing a very complete and handy tool is given.

A tool which is often used in connection with a vise and connected directly thereto is a drill press. There are two ways in which this tool may be fitted in the repair shop—either by attaching directly to the vise or by having a separate drill press mounted on a base of its own. For the use of a private garage the former is very satisfactory indeed, as it takes up but little room and is large enough for any ordinary use. The part to be drilled is placed in the vise and so adjusted that the drill will strike the desired part of the metal which is being worked. An anvil is often combined with the drill press and the vise and in this way a very useful and compact combination may be had. The larger drill presses may be fed at different speeds, and in this way are adaptable to the metal which is being worked and the thickness of the same. The accompanying illustrations (Figs. 8, 9, 10, 11, 12) show these tools as they are generally arranged.

REMOVING CARBON FROM CYLINDERS BY USE OF KEROSENE.—To remove carbon by injection of kerosene in the cylinders is at the best a makeshift method of removing this objectionable foreign matter. A method that has given satisfaction is as follows, if the valves are not placed in the head of the cylinder:

Turn the engine so that the pistons are on a dead level, and pour through the pet cocks or valve plugs sufficient kerosene to cover the pistons about 1½ inches and allow it to remain in the cylinder all night. A large quantity by the morning will have found its way past the rings into the base chamber. Now take out the exhaust valves and exhaust manifold and turn the engine several times to allow any remaining kerosene to be expelled; turn the engine so that the piston is in position. If you have no such implement, make or purchase a carbon-removing tool, and through the exhaust valve plug or outlet port, if it is placed conveniently, rake out the carbon, which will be soft. The next operation is most important, and it is upon the care with which this is done that the success of the whole operation depends. It will be understood that the inlet valve has not been touched. Take the inlet valve plug out, and what it was impossible to reach from the exhaust side should be pushed toward the latter. Wash out with kerosene from the inlet plug to the exhaust by means of a syringe, and finally with a mixture of kerosene and gasoline, half and half, clean out with some fresh rag, but always see that the inlet valve of the cylinder that is being worked upon is closed. It is advisable when the pet cock is placed in the head of the cylinder to remove same and pass a wire down it, as the orifice often becomes clogged with carbon, and although the piston and cylinder are clean the carbon in the cock becomes incandescent and causes pre-ignition. It is preferable to pour the kerosene into the cylinder direct rather than to take it in by way of the induction pipe.

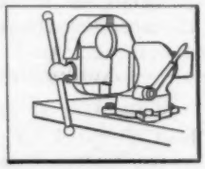


Fig. 9.—Illustrating vise mounted on work bench

As regards the lubricating oil, the base chamber should be emptied and fresh oil inserted before running the engine and it will be advisable to insert a small quantity of lubricating oil in the cylinder as well. This can be done through the valve covers, first allowing the piston to go below halfway down, and by this means pouring the oil on the walls instead of on the piston head.

Inserting a small quantity of kerosene through the pet cocks after every 300 miles should help to keep the engine clean. Some piston heads are turned rough, and will pick up carbon quickly. If this is so in your case, much trouble can be avoided by taking them out and having them polished smooth.

ALTERING THE COMPRESSION OF A MOTOR.—When it is desired to increase the compression the most general method is to attach a plate to the head of the piston. This, however, has the distinct disadvantage, especially for a single-cylinder motor, of upsetting the equilibrium. To overcome this it is necessary to touch up the flywheels, which generally carry counterweights. For a four-cylinder motor the inconvenience is less, except in cases where the motor is balanced cylinder by cylinder. There is still the disadvantage of an increase in the weight of the reciprocating parts which is likely to reduce the number of revolutions per minute. A more mechanical method is to machine a special piston with a dome-shaped head. This, however, is a costly procedure. A cheaper method is to make a new and longer connecting rod. If the compression has only to be slightly increased a clever smith can lengthen the connecting rod by heat treatment. This, however, is a delicate operation. Compression can be slightly increased by machining the valve plugs until they penetrate further into the cylinder. The angles should be rounded off in order to prevent pre-ignition, and naturally enough space should be left to allow of the normal lift of the valves. A method often employed is to plane the lower face of the cylinders, or the upper face of the crankcase, thus bringing the head of the piston nearer the top of the cylinder.

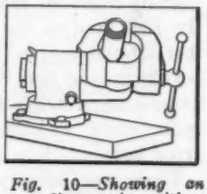


Fig. 10—Showing an ordinary vise with a pipe-holding bushing inserted

Compression may be decreased by the use of dome-shaped valve plugs; by changing the piston for one with an incurved head, or by putting a plate between the bottom of the cylinder and the crankcase. Although compression can be increased by placing a metal plate on the top of the piston, the contrary cannot be done to decrease compression, the piston generally being so thin that any planing of its surface would rob it of necessary strength. It is not advisable to change the connecting rod, for there will be danger of the lower part of the piston touching the top of the crankcase. If the metal is taken off the piston to overcome this the balance of the motor will be destroyed.

FORESIGHT NECESSARY IN PURCHASING TOOLS.—It is not very hard to fill the garage and automobile full of useless tools, yet it is a thing which can be prevented with the use of a little foresight. Taking the matter of wrenches, for instance, a double-ended wrench may be purchased which, if the specifications given to the dealer are correct, will cut in two the number of wrenches carried. It is a very common occurrence to find a machine carrying wrenches, one end of which will fit a bolt located on a part which needs occasional adjusting while there will not be a nut on the car which can be turned by the other end of the wrench. The cut shown herewith (Fig. 13) illustrates a common form of straight wrench with which the average automobilist is no doubt very familiar, since it forms part of the equipment of nearly every car. To set out upon a trip, however short, with an inaccessible nut upon the car is to invite unnecessary delay, but the tool supply should be so designed as to reach everything in reason and yet be as compact and light as possible. It is not desirable to carry an S wrench where a straight wrench or a 15-degree wrench will do the work, as it takes up more room and is no more satisfactory in the way of additional leverage. A very handy thing to have in the garage in connection with the larger wrenches is a short length of pipe which will fit over the wrench. This is only of use, however, where single-ended wrenches are used.

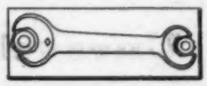


Fig. 13 — Illustrating an ordinary form of wrench, generally a part of the equipment of the car

COMPOSITION OF PRODUCER GAS.—The average gas from anthracite coal has a thermal value of about 135 British thermal units per cubic foot, and the various constituents by volume are: Carbon dioxide, CO_2, 6 per cent. Carbon monoxide, CO, 24 per cent. Hydrogen, H, 15 per cent. Nitrogen, N, 55 per cent. Also methane, CH_4, trace. Oxygen, O, trace. Producers may be made in quite compact form and the fuel required per hundred miles of travel is not so much that it would more than serve as ballast for the tractor.

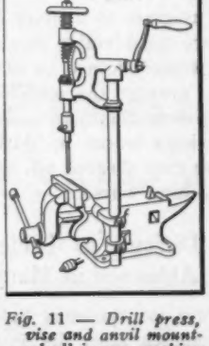


Fig. 11 — Drill press, vise and anvil mounted all in one, making a compact set of tools

THE REAL CARBURETER. — The accepted type of carbureter, taken together with its distributing manifold, forms a surface carbureter usually of quite small surface. The manifold walls form the real carbureter, and the device called the carbureter furnishes the fuel to that surface, from which any proper vapor that may exist in the final mixture is carried by the passing mixture of air.

By "typical carbureter" is meant a device in which liquid fuel is brought into contact with a moving column of air by the same pressure depression which causes the air to flow, *i.e.*, it is drawn through a passage by the motor suction simultaneously with the influx of the air with which it mixes to form the explosive mixture.

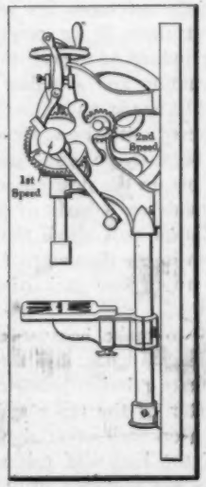


Fig. 12—A large drill press with change-speed gears

In the "typical" device, fuel is carried by flowing air from the open end of a passage located in a region of pressure lower than that of the atmosphere to which the other end is open. Lowered pressure without a correspondingly lowered temperature tends to cause vaporization. It is undoubtedly true that vaporization starts at this point as soon as the fuel has fairly left the nozzle. The intensity of this action depends upon the extent to which the pressure is lowered. The pressure reduction about the nozzle may be taken at .5 pounds per square inch, which value increases through the manifold to the valves until it reaches a value of 6 to 8 pounds with some six-cylinder engines.

Short Stories of Current Interest

Unraveling the Puzzling Situations

It is pointed out that the greatest puzzle probably lies in the fact that good examples are scarcely ever taken advantage of in a timely way, whereas bad examples seem to have a free pass into everything and go unchallenged until the purchaser no longer indicates a desire to support the issue.

IN the building of automobiles, as in the making of other machines, there are certain practices that are sanctioned by mechanicians of experience, and there are certain other practices that have failed to obtain the sanction of authority. Take, for illustration, the use of tapered pins to the exclusion of keys in the joining of rotative members or the members that have to resist torsion; it is not a sanctioned practice, nor can it be, due to the fact that no reliance can be placed upon taper pins under such conditions. In the face of this fact there are designers who harbor the impression that if one taper pin in the absence of a key is a bad thing to use two taper pins should be considered satisfactory. This way of thinking certainly offends logic, and in nine cases out of ten if logic departs the sweet-running qualities of any automobile made in its absence will take wings and migrate to a more agreeable situation. In the meantime there are considerable numbers of automobiles that have their rotative members joined by means of keys with taper pins so placed as to prevent the members from floating away from each other, but even this plan is frequently insecure, due to the fact that the keys loosen up during the course of time and the taper pins are then sheared off, making a nasty mess out of the situation, if nothing worse.

It Is Extremely Difficult to Understand Why Taper Fits Are Abhorred in Many Quarters

Of the available ways for fastening hubs and other like members on shafts and spindles, taper fits, in the absence of flanges, are the most secure, and parallel fits are not only the hardest to make but they are also the most insecure. The probabilities are that many operators in machine shops are so lacking in skill that a taper fit and the method of its production is beyond their understanding. A little study on the part of those who are unfamiliar with the niceties of taper fits will lead them promptly to the conclusion that there is no more difficulty attached to the machining and grinding of tapers than there is to be encountered in the machining and grinding of parallel surfaces.

If a taper fit is to be made and it is desired to press a hub after it is suitably tapered onto the taper of its mating shaft, the average man balks because he does not understand how to caliper the taper and obtain the desired accuracy. In the meantime, if the taper is made on a basis of 3-16 of one inch to the foot, a little computation will show that a variation of one-thousandth of one inch in the diameter of the taper is equivalent to a movement of 1-16 of one inch of the tapered hub upon the taper of the shaft.

Taper fits are easy to make because the limits of tolerance may be fixed upon a liberal basis, and they are easy to measure because there is a definite relation between any change that may be made in the diameter of the taper and the distance that the members will fetch up on each other due to changing diameter. As an illustration of the limits of tolerance that may be permitted when taper fits are indulged in, it is enough to say that for a two-inch shaft, if a press fit is desired, the limits of tolerance may be from 0.006 to 0.007 of an inch, and if the taper is finished on a grinding machine the operator who would have difficulty in keeping within these limits of tolerance can scarcely be looked upon as a fit talent to employ in work of this character. It will of course be remembered that the limits of tolerance that can be indulged in under fitting conditions of practice are a variable depending upon the diameter of the taper, and to illustrate this point attention is called to the allowable limits of tolerance if the taper is eight inches in diameter instead of two inches in diameter. In the latter case the limits of tolerance may be from 0.012 to 0.013 of an inch. For other diameters the limits of tolerance are changed in proportion to the taper dimensions.

Authorities Differ as to Tolerance Limits

In the face of the fact that the questions of tolerance have been discussed for many years, it still remains to be said that no two draftsmen seem to agree with each other, and even among the engineers of quality there is a wide difference in opinion respecting this important matter. One company under the direction of a eminent engineer worked upon this phase of machine building for 30 years, and at the expiration of this time the engineer in question was able to say: "Despite the fact that I have perfected a tabulation of limits of tolerance, taking 30 years to do so, I have never known of any engineer who was willing to risk his reputation by copying the practice that I have thus introduced into the plant over which I preside, and this is in the face of the fact that success has attended my effort." This was not a case involving a desire on the part of this engineer to inflict his ideas upon his brother engineers, but in looking around and observing the performance of machines in general as they come from many plants it was easy enough to see that a large measure of the troubles experienced during the construction period and later in service came from poor fits, and it is conceded by almost every engineer of experience that the great question is to limit the errors that machinists made so that the parts will mate with each other, and the real limit to fix for these errors is founded upon the idea that absolute perfection in the making of parts is an utter impossibility and that "neat" fits must rank as a theory, so that the underlying principle that guides the maker of a machine is based upon "error" and the remaining question is, How much shall the error be?

There are other considerations attending the fixing of the limits of tolerance in the mating of the members that go into an automobile; whether or not the limits are to be plus or minus or plus and minus must be worked out depending upon the influences of the several situations, but the fundamental principle underlying this part of the problem is based upon the "tendency." If, in machining a part, the tendency is to make it undersize the limits of tolerance should be plus; if the tendency is in the direction of an oversize it would then be fair to oppose this tendency by making the limits of tolerance minus. If the facilities are such that the limits of tolerance might be approximated with much certainty, the limits of tolerance may then be on a basis of plus or minus, splitting the limits in half. In the assembling of parts that are not made all in the same plant the limits of tolerance for the parts that have to be made in the plants should be so contrived that they will favorably react in view of the tendencies for error as they are likely to obtain in the parts that are purchased outside.

Some Facts as to Skidding

A careful manipulation of the steering wheel can often be made to overcome a very dangerous attempt to skid on the part of either the rear or front wheels. Or the skidding itself can be used to prevent the more dangerous side-slip of the car.

EITHER the front or rear wheels are liable to slip sideways if the driver attempts to alter the direction of travel suddenly on a greasy road. Rear or driving wheels when driving are more likely to lose their grip on the road than those which are rolling freely. A spinning wheel or one which is locked will often lose its individual direction of travel and become simply a point of contact on the road. From this it will be seen that side slip is usually experienced with the rear wheels and depends on the application of the brakes and the care in driving, and that it need not necessarily result from taking a turn too rapidly or too sharply. This can be shown by driving a car along a greasy road and applying the brakes with sufficient force to lock the rear wheels. The car will immediately tend to turn end-for-end upon the road and even if the road is not greasy a sort of side slipping is set up, which can be corrected by the steering gear, in causing the front of the car to move sideways in unison with or to a greater extent than the rear wheels. If the rear tires cannot obtain any grip on the road, as they are being dragged over its surface the rear of the car is apt to swing around too quickly for the driver to check such a tendency in the brief time available. Side slips of this character can only be checked by either releasing the brakes and thus freeing the wheels or by causing the front wheels to keep the car parallel with the road as soon as the first signs of slip become apparent, since once the rear of the car has swung around to any extent the driver is powerless to bring it in position again by the manipulation of the steering gear. The wheels need not be actually locked in order to bring this about; all that is needed is for them to lose their grip on the road and this occurs when they revolve at a slower peripheral speed than that of the car or when driven at a higher speed than that at which the car is moving.

DILUTION ARRESTS COMBUSTION—Four parts of nitrogen are drawn into the cylinders of an internal combustion motor with each part of oxygen. This nitrogen is not only useless in increasing the effects of the burning, but, on the contrary, it is a positive deterrent, since it dilutes the oxygen to such an extent as to neutralize much of its desirable effect. If the proportion of the nitrogen could be reduced, the burning would be correspondingly more rapid, with the consequent more rapid expansion of the gases formed, which would result in more powerful impulses being delivered to the piston. One method of reducing the proportion of nitrogen is to increase the proportion of oxygen. This has been done many times by mixing certain substances with the gasoline. A substance, to be of value in this connection, should have the following properties: it must contain a fair proportion of available oxygen; it must decompose readily into its constituents; it must be soluble in gasoline; when burned in a closed space it must not leave a liquid or solid residue, and the products formed by burning it must have no injurious action on the metal of which the engine cylinders are made.

Calendar of Coming Events

Handy List of Future Competitive and Show Fixtures

Shows

Jan. 1-5.....New York City, Grand Central Palace, Annual Show, Automobile Manufacturers' Association of America.
Jan. 6-13.....New York City, Madison Square Garden, Twelfth Annual Show, Pleasure Car Division, Automobile Board Trade.
Jan. 10-17.....New York City, Madison Square Garden, Annual Show, Motor and Accessories Manufacturers.
Jan. 10-17.....New York City, Grand Central Palace, Twelfth Annual Show, National Association of Automobile Manufacturers.
Jan. 15-20.....New York City, Madison Square Garden, Twelfth Annual Show, Commercial Division, Automobile Board of Trade.
Jan. 27-Feb. 10....Chicago Coliseum, Eleventh Annual Automobile, under the auspices of the National Association of Automobile Manufacturers.

Race Meets, Runs, Hill-Climbs, Etc

Aug. 3-5.....Galveston, Tex., Beach Races, Galveston Automobile Club.
Aug. 5.....Scranton, Pa., Track Races.
Aug. 7.....Chicago, Ill., Commercial Reliability Run, Chicago *Evening American*.
Aug. 8.....St. Louis, Mo., Reliability Run, St. Louis Automobile Mfrs' & Dealers' Assn.
Aug. 12-18.....New Orleans-to-Memphis Good Roads Tour, New Orleans *Picayune*.
Aug. 12.....Baltimore, Md., Track Races.
Aug. 12.....Philadelphia, Reliability Run, Quaker City Motor Club.
Aug. 12.....Worcester, Mass., Hill Climb, Worcester Automobile Club.
Aug. 17.....St. Louis, Mo., Reliability Run, Missouri Automobile Assn.
Aug. 25-26.....Elgin, Ill., Stock Chassis Road Race, Chicago Motor Club.
Sept. 1.....Oklahoma, Reliability Run, *Daily Oklahoman*.
Sept. 2-4.....Brighton Beach, N. Y., Track Races.
Sept. 4.....Denver, Col., Track Races, Denver Motor Club.
Sept. 7-8.....Philadelphia, Track Races, Philadelphia Auto Trade Association.
Sept. 7-9.....Hamline, Minn., Track Races, Minnesota State Automobile Association.
Sept. 7-10.....Buffalo, N. Y., Reliability Run, Automobile Club of Buffalo.
Sept. 9.....Augusta, Me., Hill Climb.
Sept. 13.....Grand Rapids, Mich., Track Races, Michigan State Auto Association.
Sept. 15.....Knoxville, Tenn., Track Races, Appalachian Exposition.
Sept. 16.....Syracuse, N. Y., Track Races, Automobile Club and Dealers.
Sept. 18-20.....Chicago, Ill., Commercial Reliability Run, Chicago Motor Club.
Sept. 23.....Detroit, Mich., Track Races, Michigan State Agricultural Society.
Sept. .....Brighton Beach, N. Y., Twenty-four-Hour Race.
Sept. .....Denver, Col., Track Races, Denver Motor Club.
Sept. .....Detroit, Mich., Reliability Run, Wolverine Automobile Club.
Sept. .....Steubenville, O., Hill Climb, Automobile Club of Jefferson Co.
Oct. 3-7.....Danbury, Conn., Track Races, Danbury Agricultural Society.
Oct. 7.....Philadelphia, Fairmount Park Road Races, Quaker City Motor Club.
Oct. 9-13.....Chicago, Ill., Thousand-Mile Reliability Run, Chicago Motor Club.
Oct. 13-14.....Atlanta, Ga., Track Races.
Oct. 14.....Santa Monica, Cal., Road Race.
Oct. 16-18.....Harrisburg, Pa., Reliability Run, Motor Club of Harrisburg.
Nov. 1.....Waco, Tex., Track Races, Waco Auto Club.
Nov. 2-4.....Philadelphia, Reliability Run, Quaker City Motor Club.
Nov. 4-6.....Los Angeles-Phoenix Road Race, Maricopa Auto Club.
Nov. 9.....Phoenix, Ariz., Track Races, Maricopa Automobile Club.
Nov. 9, 11, 12.....San Antonio, Tex., Track Races, San Antonio Auto Club.
Nov. 27.....Savannah, Ga.—Vanderbilt Cup Race, Savannah Automobile Club.
Nov. 30.....Los Angeles, Cal., Track Races, Motordrome.
Nov. 30.....Savannah, Ga., Grand Prize Race, Savannah Automobile Club.
Nov. .....Columbia, S. C., Track Races, Automobile Club of Columbia.
Dec. 25-26.....Los Angeles, Cal., Track Races, Motordrome.
Date indef.....Port Jefferson, L. I., Hill Climb, Port Jefferson Automobile Club.
Date indef.....Riverhead, L. I., Road Race, Port Jefferson Automobile Club.

Foreign Fixtures

Aug. 6.....Mont Ventoux, France, Hill Climb.
Sept. 2-11.....Roubaix, France, Agricultural Motor Vehicle Show.
Sept. 9.....Bologna, Italy, Grand Prix of Italy.
Sept. 10-20.....Hungarian Small-Car Trials.
Sept. 16.....Russian Touring Car Competition, St. Petersburg to Sebastopol.
Sept. 17.....Semmering, Austria, Hill-Climb.
Sept. 17.....Start of the Annual Trials Under Auspices of *l'Auto*, France.

THE AUTOMOBILE

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WRITING of the "state of the art" cannot be undertaken at this time without observing that many of the things that are done automobilewise are too crude to be commended; they must be dragged from their hiding places and cast into the pit of condemnation. In THE AUTOMOBILE for this week are reproductions from photographs showing a defective starting crank and the lacerated hand of the gentleman who undertook to start the motor. It is a queer place to locate knife-blades or the equivalent, which is what it amounts to when the profile of the handle of the starting crank is bounded by sharpened edges, and, remembering that infection of the most virulent sort is likely to be planted upon the handle of a starting crank by some person unawares, it merely remains for the owner of the automobile to have his hand lacerated in the cranking process when he will catch the infection and become a victim of the crude mind that thinks it is building automobiles when in all fairness a true estimate of any such product is not to be described in sanctioned language of any tongue.

* * *

AMONG the improvements that have yet to be made in the building of automobiles, a testing equipment which will locate the inharmonious location of the units to each other is necessary, and few indeed are the automobilists who are in a position to testify to the acumen of designers from this point of view. It is all very well to design and construct a good motor and to make it pass a dynamometer test before it goes into the chassis, and it is a fine thing to rig up an instrument for determining the abstract capability of the live rear axle, and another device to find such troubles as may reside in the transmission gear. But when these individual tests are conducted to completion and the units so tested are planted in the chassis frame there are a hundred reasons why they may not work in harmony with each other, and, unfortunately, it is the purchaser of the automobile so made who has to cope with the resultant disorders.

* * *

EVERY builder of automobiles will contend that a road test will develop any lack of harmony that may be present in a car after the tested units are assembled and the automobile is sent out upon the road in the hands of the tester. Looking at this situation from another angle makes it possible to point out that the chief engineer and the corps of experts who are so fond of telling what they do are really subordinate to the tester, under such conditions. The chief engineer is only responsible for the design, construction and testing of the individual units, and the "tester" must be given credit for fixing the relations that result in harmony of performance, if by any chance this desirable condition creeps into the aggregation, but if the great designers of the units are willing to admit that the tester measures far short of their capabilities the wonder is that they would be willing to assign to him the task of harmonizing the relations of the units and placing at the disposal of the buyer of the car a silent and flexible performer.

* * *

FURTHER evidence of great activity in the field of motor designing continues to appear in the pages of THE AUTOMOBILE from time to time, and it is almost a moral certainty that the patrons of the industry will become somewhat confused in their ideas if they attempt to choose between these types of motors, or if they serve as the "jury" in the process of arriving at conclusions, rendering a snap-shot decision. Almost every example of piston and slide-valve motors that is now being brought out in the guise of something new and wonderful has been tried in one way or another heretofore, and the only question is, Are the men of to-day so much more skilled in the art that they can gain success in its fullest measure on the very battle ground that brought abject failure to the designers of yesterday? That the art has advanced many measures in the course of a few years is quite too true to merit further discussion, but there are limits beyond which skill in its most refined form, supported by ingenuity in all its ramifications, will fail to penetrate. The patrons of the automobile industry can well afford to lay back in the tonneau seat of a well-made automobile of to-day, listen to the purr of a fine-spun motor, even of the poppet-valve type, and await with equanimity the proof that is now lacking of the newer facts as they bear upon utility, so that when the proper time comes they may compare the products of the several schools of design on a basis of equity and see for themselves which is the best for their needs.

Special Fire Board Working Hard

Committee Considering Specifications

Technical body of the Fire Department is compiling a set of specifications to be followed by the manufacturers of automobiles and fire apparatus in competing for the contract to motorize the New York department. There is $700,000 available for the purchase of fire equipment at present and much more may be added to that sum. Makeshifts and patch-work are to be at a discount in filling this contract and the whole effort of the department will be directed toward securing the best results.

WORKING full union hours, the special board named by Fire Commissioner Johnson to motorize the New York fire department is about the busiest committee in the municipal government of New York City. Under the direction of Deputy Commissioner Farley, the board is holding daily sessions at headquarters. Chief Kenlon, of the department, who was named for that position Tuesday noon, Chief John P. Howe and Captain Demarest are the colleagues of the Brooklyn Deputy Commissioner.

Commissioner Johnson is impressed with the idea of improving the service of the department and has instructed the committee to use the utmost diligence in deliberating upon the questions that come before them. He believes that makeshifts are uneconomical and that the perfect fire-fighting apparatus should be a complete whole rather than an assemblage of an automobile and one of the various bodies useful in the work of the department.

In the past sets of specifications for both automobile and fire department bodies have been prepared without plans and drawings and bids have been asked from manufacturers. Some of the apparatus submitted has been good as an automobile and more of it has been good as fire-apparatus, but experience has been plentiful to show that much of the mechanism tested has not proved to be satisfactory as automobile-fire apparatus.

Where specifications have been offered, the bidding has not been sufficiently general to afford the widest choice. The manufacturers of automobiles sometimes have been required to make unusual alterations in their stock models in order to come within the terms of the specifications and, of course, were obliged to rely to a greater or less extent upon the manufacturers of fire apparatus or some of their equipment. The makers of fire apparatus naturally have an advantage in the bidding for bodies, but this is counteracted by the fact that they are not manufacturers of automobiles in a broad sense.

The situation as it has now been developed is that the fire department is looking for apparatus driven by gasoline engines that shall be symmetrical in service, utility and appearance.

It is pointed out that only a small mileage is required of motor fire apparatus in the course of a year. This mileage must be accomplished at high speed and with the utmost certainty. While it is known that wear and tear on an automobile increase as the square of the velocity, the fact remains that fire apparatus has much labor lavished upon it in its periods of rest.

For instance in some of the outlying stations there are few calls in the course of a year, one in a month being a liberal estimate. Now, during all the time except for the few hours or minutes in which the engine is fighting the flames, it stands in its house, the central object of the care and attention of a whole company. Thus it is a simple matter to maintain an automobile fire engine in the highest notch of efficiency and the fire department in buying such engines does so in the belief that they will last for many years.

The trouble met with in the past has been that numerous makers are able to comply with the measurement requirements and that few of their products have been able to meet the service tests. It is the main object of the board to compile such a set of specifications that when the apparatus is submitted it will cover the ground of the practical tests. Deputy Commissioner Farley has formulated a report covering this point and in the course of a few days it will go to the commissioner for action.

It is the intention of the department to conduct an automobile school for the purpose of training expert drivers and mechanics.

Garden to House Its Last Show

According to official announcement the automobile show which will be held in Madison Square Garden from January 6 to 20, 1912, will be the last ever to be held in that historic structure. The reason for this state of affairs is not that there will be no more automobile shows of the size reached by recent shows in the Garden, but because the Garden itself is about to be razed to make room for a gigantic office building.

But the show will be held in January and it is predicted by those who will be in charge of it that it will exceed in size and importance anything in the way of an automobile show ever staged in that building.

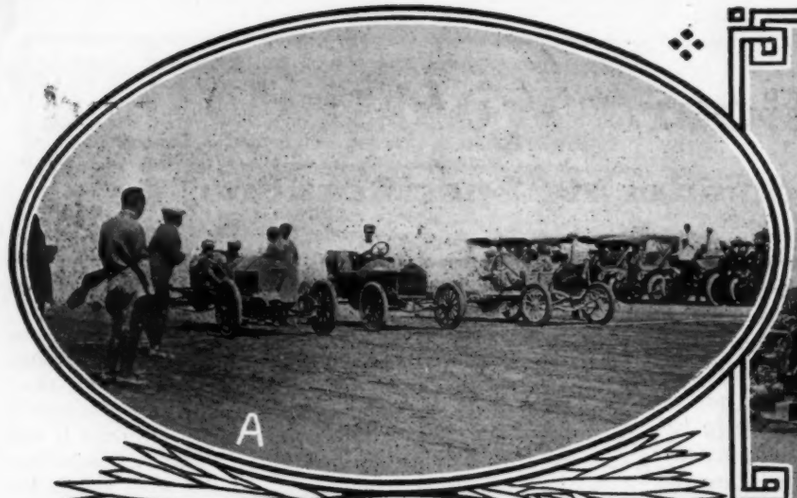
It will be a two-part show as was that of 1911. The pleasure vehicles will hold forth from January 6 to 13 and the trucks will be on exhibition from January 15 to 20. The same exhibition committee as last year's will be in charge, comprising: Col. George Pope, chairman; Charles C. Clifton, Alfred Reeves and Merle L. Downs, secretary.

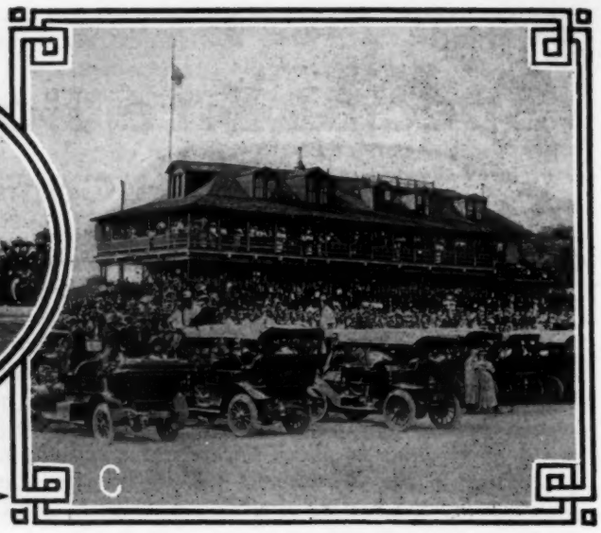
The only way the show of 1912 will differ from that of 1911 will be in its contemplated size. Application blanks for space will soon be issued and allotments will be made shortly.

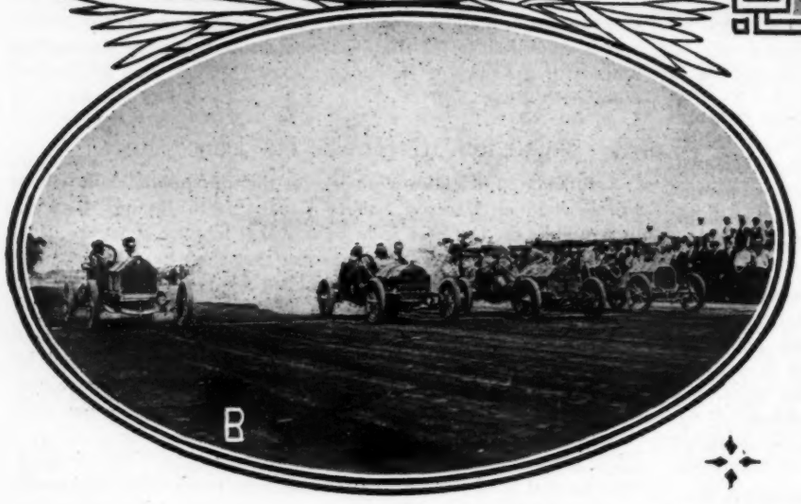
Whiteside Heads Stevens-Duryea

CHICOPEE FALLS, MASS., July 31—At a meeting of the stockholders of the Stevens-Duryea Company, July 29, W. H. Whiteside was elected a director of the company. There was also a meeting of the board of directors held, at which Mr. Whiteside was elected president of the company to fill the vacancy caused by the resignation of Irving H. Page. Mr. Page was at the same meeting elected chairman of the board of directors and treasurer of the company.

President W. H. Whiteside of Stevens-Duryea Company







A—Start of the ten-mile 161-230 race—Buick, Metz, Abbott-Detroit

B—Line-up in the ten-mile 231-300 race—Kline, a pair of Mercers, Staver-Chicago

C—Looking from the field toward the clubhouse during the last race

Fair Card at P

Mercer Wins Four R

Remy Brassard changes holders, but remains in same control. Small fields and lack of sharp competition in races are overlooked by big and enthusiastic audience at mid-summer meeting of the Quaker City Motor Club at Point Breeze track. Stock car events find no place on program. Track record is cut about a second in the mile trial. Opel car makes its bow to American public in races.

PHILADELPHIA, July 29—Approximately 10,000 enthusiasts witnessed the running of the card of races at Point Breeze track this afternoon, the occasion being the annual mid-summer meeting of the Quaker City Motor Club. The Remy Brassard, which was won by the Blitzen Benz (Burman) at Brighton Beach, July 4, was transferred to the Mercedes (Knipper). The ownership of the trophy and prize, however, was not altered, as both cars and both drivers are controlled by the same interests.

The first event of the day was a ten-mile race in which three cars were entered, and developed into a procession soon after the start, a Buick (Brennan) opening a wide gap over its opponents, an Abbott-Detroit, W. P. Padula, driver, and a Metz, piloted by Harry Baker. At the conclusion of the 6th lap the Buick was leading by half a mile, a lead that was further increased as the race progressed, winning in hollow style.

The one-mile exhibition for the Point Breeze circular dirt track record was next carded. After a preliminary tuning-up spin around, Burman signaled that he was ready and the Blitzen Benz completed the circuit in 58 4-5 seconds.

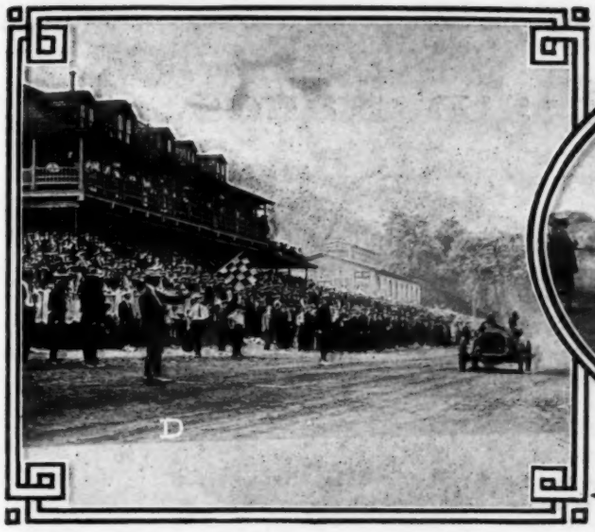
In the second event, after the second mile, the Mercer (Ringler) had all his own way. It, too, was a 10-mile race and drew four entries. During the course of the race the winner lapped both the Staver-Chicago, and Klinekar, which finished second and third respectively. The time made was the best of the day for a ten-mile event, 11 minutes 17 2-5 seconds.

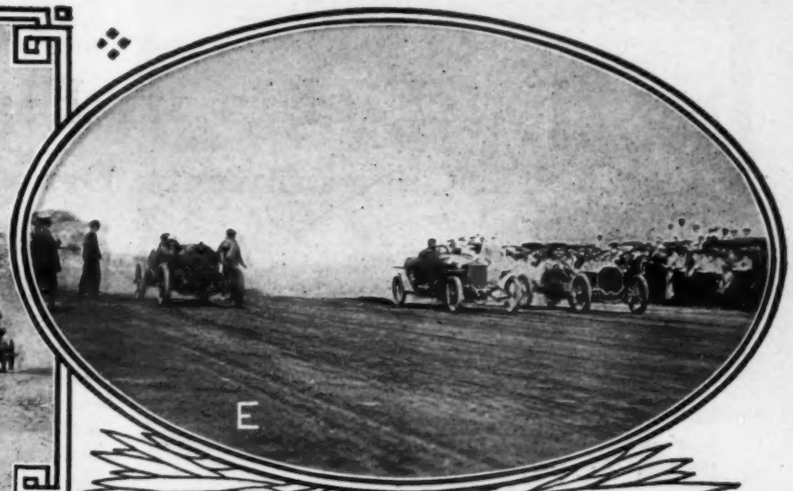
The third race saw the introduction of a freak machine in the shape of a cigar, even to the band encircling it. It was an Opel car, driven by Richter, and had as opponents a Jackson car driven by Harry Cobe and a Klinekar. The last-named car threw a tire on the fifth lap and the race developed into a two-car affair, the foreigner winning in 12 minutes 19 4-5 seconds.

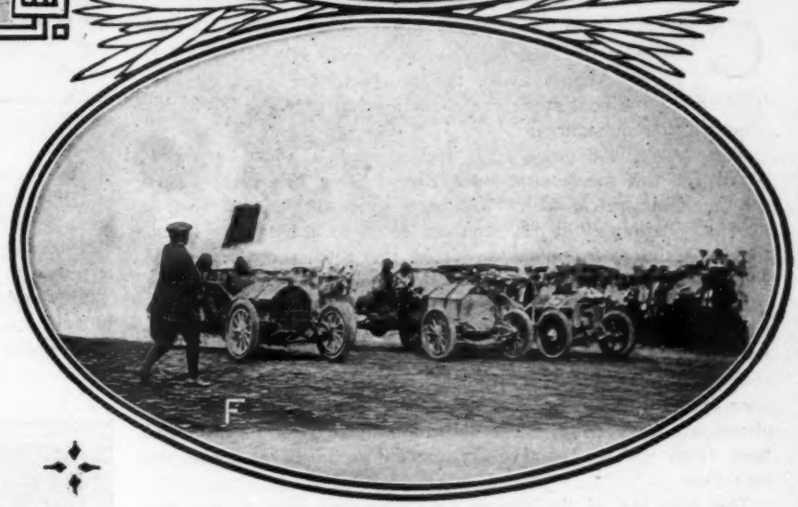
Next run off was a substituted special race between five cars. Right at the jump the Mercer (Hughes) developed engine trouble and was forced to retire from the track. In the meantime Mercer (Ringler) opened up a big lead and the other contestants, Du Closne in a Staver-Chicago, Winkler in a Klinekar and Brennan in a Buick kept plugging away, and the spectators were surprised when Hughes reappeared and essayed the apparently hopeless task of catching up, finishing second.

In the contest for the Remy Grand Brassard and Trophy, Burman and Knipper, the former piloting a 110-horsepower Benz and the latter a Mercedes, cut out a record-breaking pace for the first two miles, at the end of which the Opel (Richter), the only other contender, was trailing half a lap in the rear. The Benz and Mercedes passed the judges' stand almost simultaneously in the second and third laps. Nearing the homestretch on the fourth mile, Burman was seen to slow down and finally stop altogether, his chance gone by reason of a broken feed pipe on the Benz.

The 10-mile handicap was won by the Mercer (Ringler) in







D—Mercer, Ringler driving, winning the ten-mile handicap

E—Line-up of starters in the ten-mile 301-450 race—Kline, Opel and Jackson

F—Start of the 25-mile free-for-all—Mercer, Staver- Chicago, Mercer

Point Breeze

Races With Ease

10 minutes 49 seconds; Mercer (Hughes) finishing a close second in 10 minutes 59 seconds, the other cars finishing at varying distances back, and never seriously threatening the leaders.

The meeting concluded with a 25-mile combination race and had three entrants. Mercer (Hughes), won; Mercer (Ringler), second, and Staver-Chicago (Du Closne), third. The summary:

Division 2C, 10 Miles, 161 to 230 Cubic Inches

No.	Car.	Driver.	Position.	Time.
22	Buick	J. Brennan	1	12.27
7	Abbott-Detroit	W. P. Padula	2	13.19⅘
30	Metz	H. Baker	3	13.33⅘

Time Trial, One-Mile Exhibition for Track Record, 59 3-5

Blitzen Benz	Burman		58⅘ secs.

Division 3C, 10 Miles, 231 to 300 Cubic Inches

4	Mercer	Ringler	1	11.17⅘
21	Staver-Chicago	Du Closne	2	....
11	Klinekar	Morton	3	....

Division 4C, 10 Miles, 301 to 450 Cubic Inches. (Weight limit 1800 pounds

24	Opel	Richter	1	12.19⅘
29	Jackson	Cobe	2	....

Class D, Free-For-All, 5 Miles, Flying Start. Remy Grand Brassard and Trophy

3	Mercedes	Knipper	1	5.34⅕
24	Opel	Richter	2	
28	Benz	Burman	Withdrew	

Special Race, Ten Miles

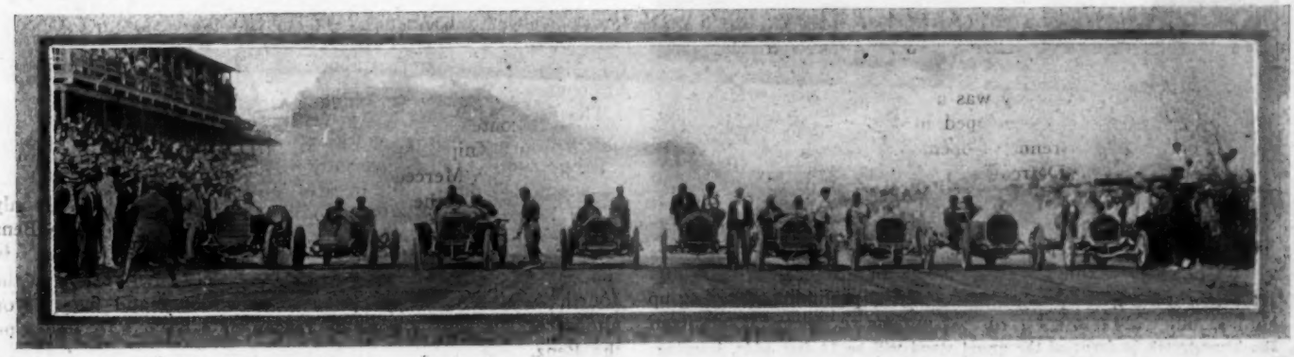
4	Mercer	Ringler	1	11.39⅘
5	Mercer	Hughes	2	11.55
21	Staver-Chicago	J. Du Closne	3	....

Ten-Mile Handicap, Open to All Cars Entered At Meet

4	Mercer	Ringler (30 sec.)	1	10.49
5	Mercer	Hughes (scr.)	2	10.59
22	Buick	J. Brennan	3	....

Twenty-Five Mile Combination Race

5	Mercer	Hughes	1	27.24⅘
4	Mercer	Ringler	2	.....



Line-up in Event No. 7—Buick, Klinekar, Klinekar, Mercer, Metz, Mercer, Opel, Abbott-Detroit, Jackson

Big Fields in Elgin Races

Stock Car Contests Draw Many Entries

Course for National Stock Championship events has been carefully improved and prepared for the four races that will be held August 25-26. The homestretch has been widened, grades cut down and turns made safe in anticipation of the greatest exhibition of its kind ever held. The average width of the course has been increased at least fifty per cent. over last year and as at present arranged, three cars can move through the stretch on even terms.

CHICAGO, July 31—With twenty-three entries already made in the four big road races that will be run off at Elgin, August 25-26, the prospects are favorable for holding the national stock car championship races under highly improved circumstances.

The course is 8 miles 2,499 feet around and has been prepared for the races with much care. Elgin has spent $4,000 on the homestretch, which has been widened from 16 feet to 54 feet. Britten's hill has been cut down to a considerable extent and the gravel resulting from the cutting operation has been used in the work on the stretch.

Udina turn at the southwest corner of the circuit has been entirely remodeled. Last year it was a dangerous curve but now it looks as if a car could make it almost at full speed. By cutting into the field on the inside, the road at this point has been widened to 100 feet, an easy swing which gives the drivers plenty of elbow room. The telegraph poles have been moved back from the road and every precaution taken to make the turn safe.

The west leg of the course was a country lane a year ago but now it is one of the best parts of the course. It is a mile in length. The McQueen turn at the northwest corner of the course which will swing the races into the west leg going south also has been improved. Instead of cutting into the bank much the work has been done on the outside.

The east and north legs also are in rare condition. Starting at Hornbeek's the east leg is only a short dash to McLean's corner. At the latter point the owner of the property has given permission for the course to cut across his lawn in order to make a wider turn at that place. This will swing the racers into the backstretch which angles into the northwest and which last year was the best part of the circuit. It has been improved if anything and in many places is wider than before. The foundation of this road is good and it required little work to put it into condition for the race.

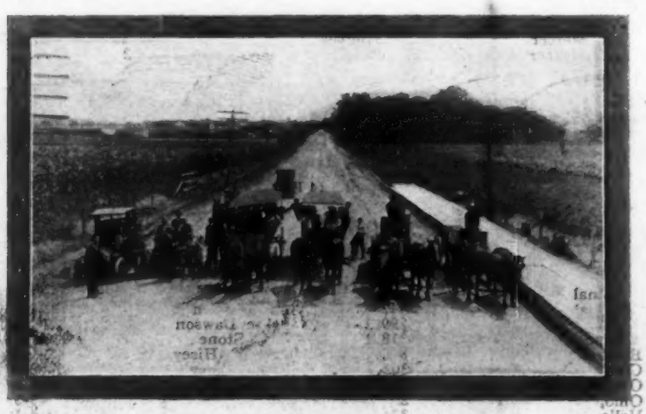
As the course is at present it will average 24 feet in width for the entire circuit whereas in 1910 it barely showed 16. The turns have all been given attention and the only one that has not been widened is at Hornbeek's. There the outer edges of the four corners have been so improved that the turn is much safer.

At present the Elginites are engaged in oiling the course. Up to yesterday 24,000 gallons of oil had been put on and there yet remain 50,000 gallons before the work will be completed. Last year only 44,000 gallons of oil were used and yet the course was dustless. Getting such a start this time, the oil will be permanently set before the circuit is turned over for practice.

The work of constructing the grandstand has not started as yet, but this will not delay matters any. The stand this year is to be 650 feet in length and capable of seating 6,600 people. The boxes will be placed at the top of the stand and will be covered.

On the inside of the course at the tape will be located the judges' stand, the press stand, a covered stand for invited guests, the hospital tent and the official cars. The scoreboards will be placed on top of the press stand which is 60 feet in length and capable of accommodating 200 newspaper men. In addition to the main score board there will be others placed around the circuit, the farmers having stipulated in their contract with the Elgin association that there be a scoreboard each mile of the course.

Magnificent level straightaway on the backstretch where fast time will be made



The homestretch in front of the grand stand will be 54 feet wide, insuring ample room for three cars abreast

The races will start at 11 instead of 10 o'clock. Where the course was closed at 9 o'clock last year, this time the spectators will have until 10.40 to get to their places. Occupants of parking spaces will have until 10:30 to get to their locations.

The honorary referee will be George E. Hunter, of Elgin, representative of the Elgin Watch Company, which gave the Elgin National trophy. The referee will be David Beecroft, president of the Chicago Motor Club. Honorary judges include: R. P. Hooper, Carter H. Harrison, mayor of Chicago; George Tiedeman, mayor of Savannah, Ga.; Harvey Granger, president Savannah Automobile Club; C. H. Hurlburd, president

Elgin Watch Company; W. E. Metzger, president National Association of Automobile Manufacturers; S. A. Miles, general manager National Association of Automobile Manufacturers; Charles Clifton, president Automobile Board of Trade; Carl G. Fisher, president Indianapolis Motor Speedway Company; Asa Candler, president Atlanta Automobile Speedway Company; Hugh Chalmers. Detroit.

The active judges will be: N. H. Van Sicklen, Sr., Chicago Motor Club; Everett C. Brown, president Amateur Athletic Union; T. J. Hyman, Chicago Automobile Club; Allen S. Ray, Chicago Automobile Club; W. Rufus Abbott, president Chicago Athletic Association; Walter Egermann, Aurora Automobile Club; H. B. Hemens, president Elgin Automobile Road Race Association; W. C. Thorne, Chicago Athletic Association; Thomas J. Hay, Chicago Motor Club; Henry Paulman, Chicago Motor Club; James E. Plew, president Aero Club of Illinois;

The turn at Udina, formerly the worst on the course, has been widened to 80 feet

Harold McCormick, vice-president Aero Club of Illinois; J. K. Stewart, Chicago Motor Club; Frank W. Wentworth, Chicago Athletic Association.

In recognition of the generosity of the Aurora Automobile Club in donating the cup for the 161-230 class on the first day it has been decided to call that trophy the Aurora cup instead of the Fox River.

Up to Monday there had been twenty-three nominations made for the four races, the last ones to register being two Simplexes, two Velies, an Abbott-Detroit and a Pope-Hartford. The list to date is as follows:

Elgin National (Under 600 inches)—Lozier, two Nationals, three Alcos, two Simplexes, and Pope-Hartford.

Illinois Cup (451-600 class)—Two Nationals, two Velies.

Kane County Cup (231-300 class)—Three Falcars, three Staver-Chicagos, two Coles, three Colbys and Corbin.

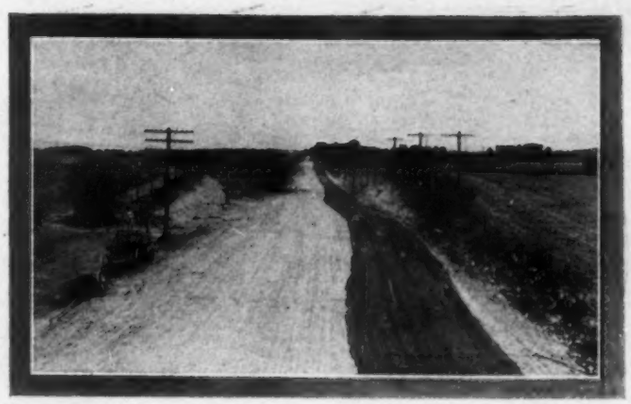
Aurora Cup (161-230 class)—Abbott-Detroit.

Dead Horse Hill Climb August 12

WORCESTER, MASS., July 31—First among the hill climbing contests in the East this year will be the annual event of the Worcester Automobile Club on Dead Horse hill, August 12. Entries are coming in early for the climb and the latest contestants to be enrolled are two Simplex cars which will be handled by a pair of skillful amateur drivers. So far the list is well advanced and the event promises well-balanced fields and keen competition.

The hill is being given a thorough preparation for the climb and the club members believe it will be in better shape this year than ever before. The record for the hill is held by a Stanley Steam Car driven by Baldwin in 1908 and stands at 54 seconds. A Fiat holds the gasoline record in 58 seconds.

The hill is exactly one mile long and is perfectly straight. It starts on the flat and dips slightly immediately after crossing



Showing how Britton's Hill has been cut down. Note the beginning of the oiling process on the right

the line. From the end of the dip it rises sharply in a series of heartbreaking jumps to the summit.

Owing to the fact that this year hill-climbs are rather rare everywhere in the country, the Worcester event is attracting much attention. Last year the meeting was one of the best run off and the program contained a series of stock car contests that developed some interesting climbs.

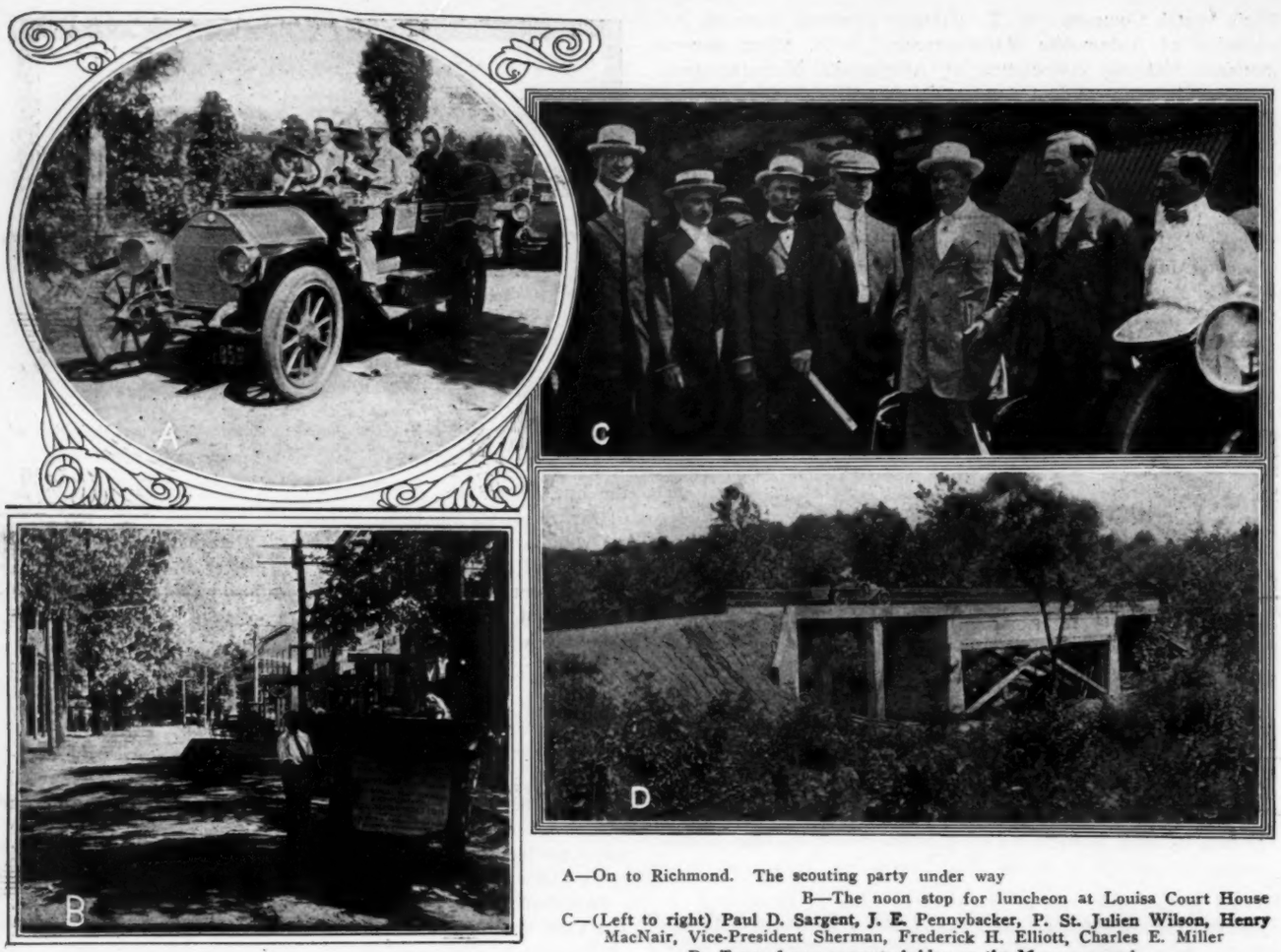
Nationals Win at Cincinnati Climb

CINCINNATI, O., July 31—Safe, sane and sensible was the automobile hill climb in this city yesterday afternoon. It was directed by the Cincinnati Automobile Dealers' Association and not a mishap marred the afternoon's sport. The Stanley Hill course was 2,340 feet and had a grade of 11 per cent. and all events had flying starts.

First honors went to the National cars, winning three firsts. The Cino and Ohio, Cincinnati products, gave a splendid account of themselves.

The summary:

Car.	Piston Disp.	Driver.	Time.
	Class C. Non-Stock		
Empire	153.9	E. Stone	:51 3-5
Flanders	154.8	L. H. Sackett	:58 1-5
	Class C. Non-Stock		
Oakland	201.1	A. Bauer	:40 2-5
Elmore	175.9	W. B. Hambly	:48
Paige-Detroit, B	176.7	Wayne Stacy	:49 1-5
E. M. F.	226.2	L. H. Sackett	:51 4-5
Elmore	175.9	A. F. Maiden	:53 2-5
	Class C. Non-Stock		
Marmon	299.	Joe Dawson	:28 4-5
Cino	300.7	J. Raimey	:32
Ohio, J.	299.	Chas. Thatcher	:32 3-5
Ohio, J.	299.	H. S. Mathews	:33 1-5
Cino	300.7	F. E. Radina	:36 4-5
	Class C. Non-Stock		
National	447.	J. Aitken	:29 1-5
Marmon	318.1	E. Stone	:30
Buick	318.1	H. C. Hisey	:31 2-5
Velie, H-1	334.	R. Jeffkins	:35 2-5
	Class C. Non-Stock		
National	589.	H. Wilcox	:25 1-5
Matheson	477.2	H. C. Dixon	:39 2-5
	Automobile Club Members Only. (4 Passengers)		
Cino	300.7	F. E. Radina	:38 2-5
National	447.	Chas. Schiear	:40 2-5
Matheson	477.2	J. S. Stevens	:45
American	318.1	L. H. Sackett	:51 1-5
	Free-For-All. (4 Passengers)		
Cino	300.7	F. E. Radina	:36 4-5
National	447.	J. Aitken	:39 2-5
American	318.1	L. H. Sackett	:51 4-5
Matheson	477.2	H. C. Dixon	:57
	Free-For-All		
National	589.	H. Wilcox	:25 1-5
National	447.	J. Aitken	:28 3-5
Marmon	299.1	Joe Dawson	:29
Marmon	318.1	E. Stone	:29 4-5
Buick	318.1	H. C. Hisey	:29 4-5
Cino	300.7	J. Raimey	:32 2-5
Ohio, J.	299.	H. S. Mathews	:32 3-5
Ohio, J.	299.	C. Thatcher	:33 3-5
Velie, H-1	334.	R. Jeffkins	:36 4-5
Matheson	477.2	H. C. Dixon	:42 3-5



A—On to Richmond. The scouting party under way

B—The noon stop for luncheon at Louisa Court House

C—(Left to right) Paul D. Sargent, J. E. Pennybacker, P. St. Julien Wilson, Henry MacNair, Vice-President Sherman, Frederick H. Elliott, Charles E. Miller

D—Type of new concrete bridge on the Manassas road

Routing Good Road Tourists

T. C. A. Selects Path to Richmond

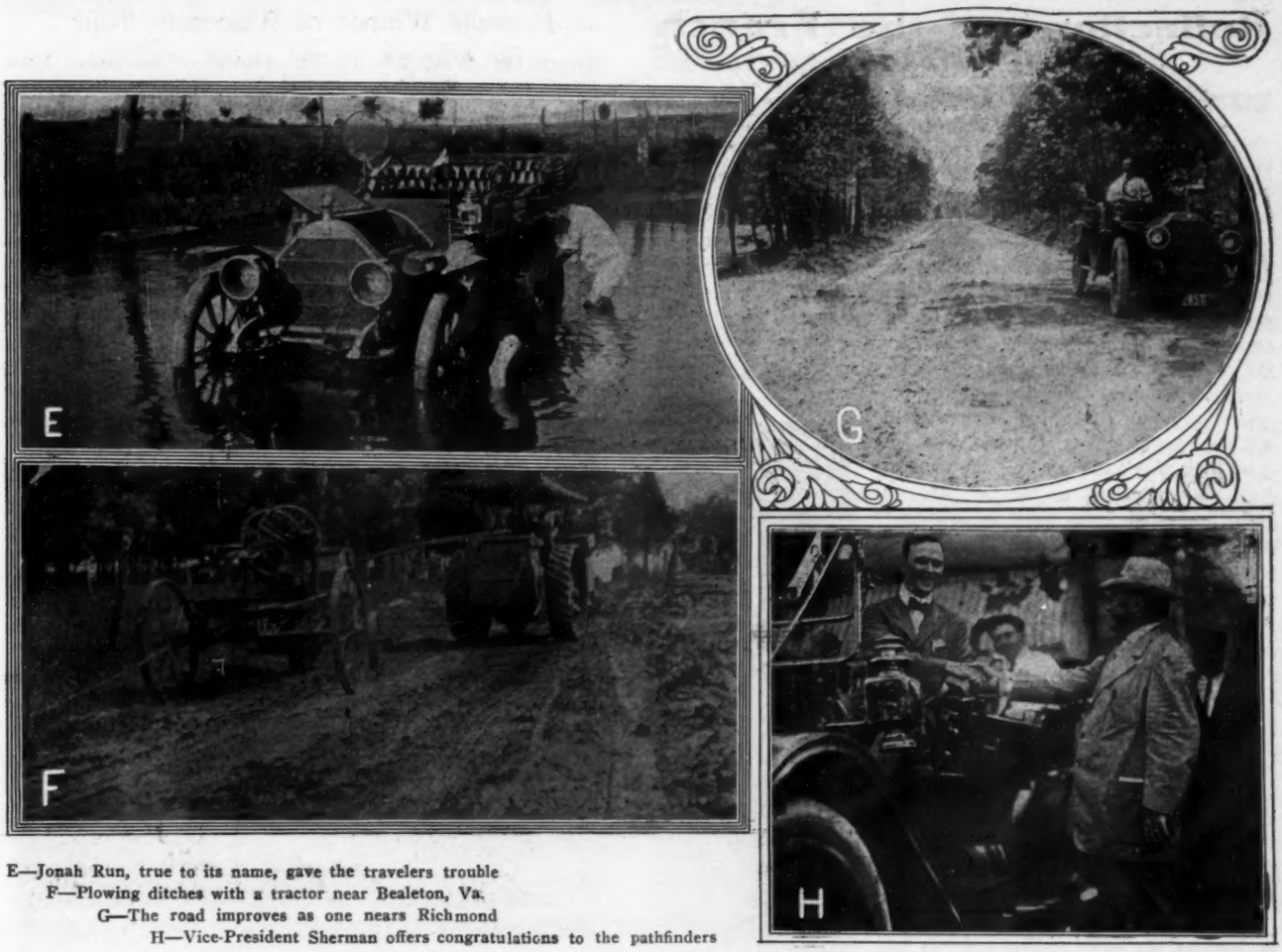
Three cars carrying the pathfinders of the T. C. A. were engaged in the recent trip from Washington to Richmond, where the national convention in the interest of good roads will be held next Fall. The trip is graphically described and the preliminary work for the convention is outlined. Distinguished party accompanies the pathfinders, foreshadowing the great importance of the convention and the interest that it is attracting already.

WASHINGTON, D. C., July 31—Unquestionably, good roads are of first importance from an automobile viewpoint, and when the pathfinders of the Touring Club of America blazed a trail to Richmond last week they started in motion a vast machinery which is destined to result in benefit to the motoring public.

The party which consisted of three cars left the southeastern branch of the Touring Club of America in the Colorado building, at 10.30 a. m. on Monday, Vice-President Sherman being on hand to bid them godspeed. Mr. Sherman is an enthusiastic motorist and the honorary chairman of the advisory board of this branch of the T. C. A. In the first car, a Velie Forty, Charles E. Miller sat at the wheel with H. E. Duckstein of the Washington *Post*, Howard Fisk of the Washington *Star* and S. S. Grogan of the Washington *Herald*. In the second car, a Packard thirty, Lee A. Folger of the Gordon Motor Company was at the wheel, and Henry MacNair, editor of the *Automobile Blue Book*, sat on the front seat.

In the rear were Hon. Paul D. Sargent, acting director of public roads and Capt. P. St. Julien Wilson, Virginia State highway commissioner. The third car was manned by Fred H. Elliott, secretary Touring Club of America; Harry Ward, automobile editor Washington *Times*, and J. E. Pennybacker, secretary American Association for Highway Improvement.

The middle route was chosen for the trip to Richmond, via Fairfax, Warrenton, Culpeper, Orange and Louisa. While sixty miles longer than the old telegraph road which goes through Fredericksburg, it is very much superior and more easily traversed. The run to Fairfax was made in an hour, where a two-hour stop was made and speeches indulged in. The party also visited the county clerk's office where the original will of George Washington is on exhibition. The party got away from Fairfax shortly after one o'clock and followed the old Middleburg pike, arriving at Warrenton at 4.30, where a funeral interfered with the meeting which was scheduled at that place. The roads



E—Jonah Run, true to its name, gave the travelers trouble
F—Plowing ditches with a tractor near Bealeton, Va.
G—The road improves as one nears Richmond
H—Vice-President Sherman offers congratulations to the pathfinders

up to Warrenton were fairly good although there were a number of water-bars and much bad going along the old turnpike where the driveway had been made to one side of the road.

After being entertained at Warrenton by members of the Fauquier Club, the party started on the road to White Sulphur Springs, passing the magnificent estate of the late E. H. Harriman. A thunderstorm had preceded the party and the roads were very heavy so that poor progress was made.

As the party was nearing Culpeper on the worst part of the roads yet encountered, a horse belonging to E. Lester Jones became slightly frightened and Mr. Jones turned his horse to one side of the road to allow the car to pass. The horse pranced considerably but made no effort to run away. Notwithstanding this, Mr. Jones telephoned to the sheriff to hold the driver of the car until he could come in. A fine of $25 was imposed for speeding, although all witnesses agreed—including Mr. Jones himself—that it would be impossible to go more than six or eight miles per hour over the road, the speed limit in Virginia being 20 miles on straight roads.

The night was spent at Culpeper and early next morning a start was made via Woodberry Forest School on a fine macadam road into Orange. Here another meeting was called by Commissioner Wilson, and one of the supervisors went with the party to Gordonsville, where they visited a convict camp and watched the process of road construction. The next stop was Louisa where luncheon was served, consisting of Virginia fried chicken with all the attendant delicacies. At three o'clock the journey was resumed, passing through several small villages on the way to Richmond. Twenty miles out the delegation was met by motor enthusiasts of the Southern capital and members of the Richmond Automobile Club who escorted the pathfinding party to the Hotel Jefferson. A representative of the Atlanta Chamber of Commerce met the party at the hotel, having in view the object of securing the convention for Atlanta next year.

The return trip left the Jefferson Wednesday morning at 11 o'clock, stopping at Louisa for luncheon. The route was retraced as far as Orange, but beyond Orange, instead of going through the grounds of the Woodberry High School, the regular road was followed which had but one turn and over which better time could be made, especially where there are a large number of cars, as the road through the school grounds is very narrow and winding. Culpeper was reached about 6 o'clock and the town was found to be overrun by soldiers of the State militia who were encamped just outside the village.

From Culpeper it was decided to follow the Southern Railroad to Remington. On this stretch about seven miles of macadam was encountered, the only untoward incident being the fording of Jonah Run which was greatly swollen by heavy rains on the night before so that water came up into the carbureter and stopped the pilot car. It was necessary for the occupants to remove their nether garments and push the car out to a point where the carbureter could be drained and again put in action. At Bealeton a road runs directly to Warrenton which is undoubtedly the best way to make the trip and the way which the cars will be routed in October.

However, having in view the exploration of the shorter route the cars proceeded along the route to Calverton, Catlet, Nokesville and Bristol to Manassas, where a number of Union and Confederate veterans were hobnobbing together in commemoration of the fiftieth anniversary of the memorable battle of Bull Run.

From Fairfax the cars went over a new piece of macadam to Vienna and thence into Falls Church, across aqueduct bridge into Washington, which was reached at 4.10 p. m. Thursday.

Reflections of the French Grand Prix

The latest news to hand from France has it that mechanical troubles put more drivers out of the running than did the tires, as was first thought. The heat was terrific for cars to run the mileage required and no doubt this was responsible in a certain measure for part of the troubles.

ALL credit is due to Hemery on the Fiat for his victory in the French Grand Prix, as the car was a stock car, from external appearances, and in an interview after the race Hemery stated that he and his mechanic had to stop quite frequently to reverse the spring shackles, which were designed to receive the weight of a touring body to hold them down. The outstanding feature of the day was the consistent running of the small Bugatti rated a 7 horsepower with a Monobloc motor of 2 1-2 by 4.3 bore and stroke. The small car held on tenaciously to the last and was only prevented from finishing owing to the fact that the roads were thrown open to traffic at 4 o'clock, there being two other cars still in the running, a Rolland Pilain and a Cote.

The following is the list of cars that were put out of the race and the cause of the trouble: Porthos, cracked cylinder; Cottin, broken steering gear; Rolland Pilain, broken front axle; Corre (Fournier), broken front axle; Cote, broken change speed lever; Cote broken radiator; Excelsior, spark plugs stuck in steel cap; Rolland Pillain, broken front axle; De Dietrich, broken differential; Gabriel, magneto trouble.

The illustrations show the method of banking the turns so that a driver will have a chance of keeping on the road even if he were to take the turn wide. The car driven by Fournier was four years old, while the Deitrich, driven by Duray, has stood the racket for five years.

In all fourteen cars faced the starter, and when it is remembered that only four were running at the finish, and most of the others had been put out by mechanical troubles, it is an object lesson that manufacturers had better stand down rather than run cars that have not been tested.

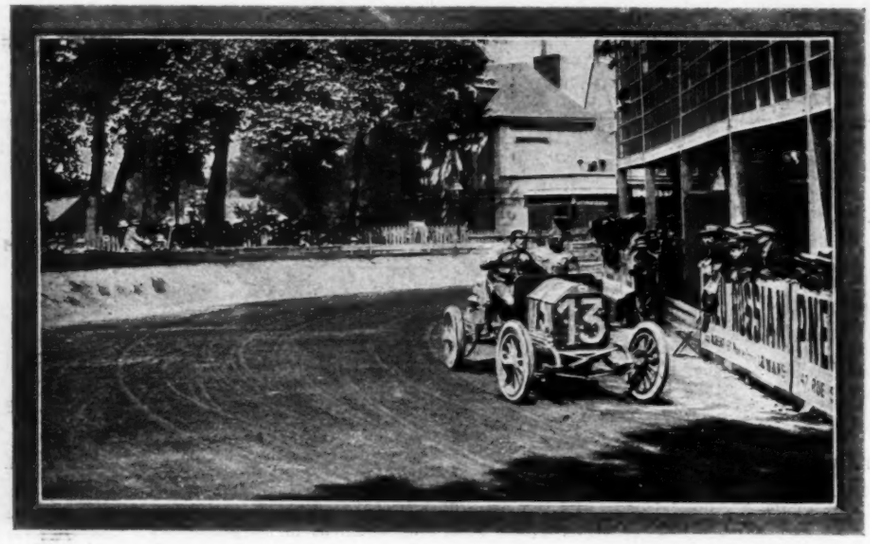


Fig. 1—Hemery in Fiat rounding the turn at the grand stand. The outside banking will be noticed

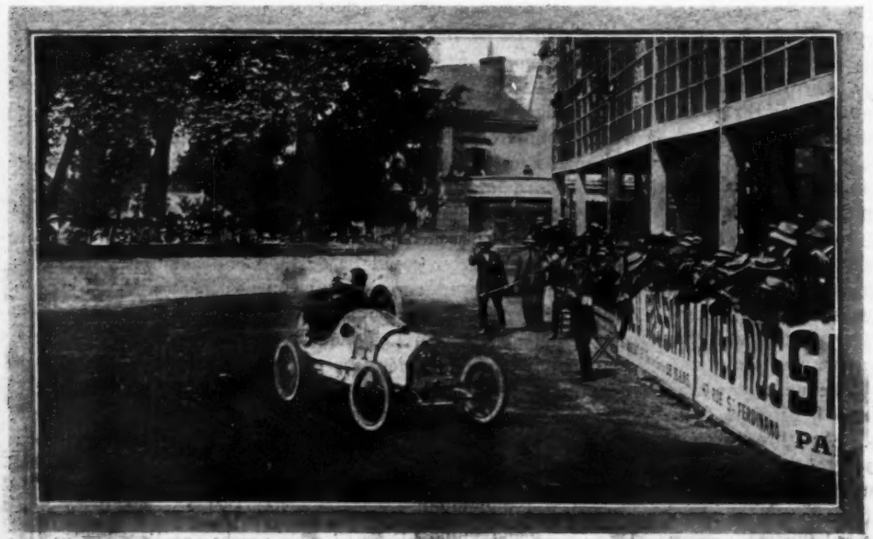


Fig. 2—The 7-horsepower Bugatti receiving the plaudits of the spectators for the fine performance it put up

Protests Winner of Wisconsin Tour

MILWAUKEE, WIS., July 31—The protest of the Jonas Automobile Company, Milwaukee, against the awarding of the *Sentinel* and the *Evening Wisconsin* trophies in the second annual Wisconsin reliability tour to any car but No. 1 Cadillac, has been denied by Referee Michael S. Sheridan on the ground that the protest was entered after the expiration of the 24-hour limit after the posting of the official score at the headquarters. The Jonas company has now appealed to the contest committee.

The official score gives the *Sentinel* cup, a sweepstakes, to the Imperial No. 8 and the *Evening Wisconsin* cup, for best score in the roadster class, to the Ford No. 6. The Imperial also wins the *Journal* cup for touring cars.

The protest was based on the allegation that the first examination of the Cadillac returned this car with a perfect score, giving it first place in the entire tour. It seems that the technical committee of the W. S. A. A. examined the Cadillac, No. 1, and after completing work on this car released it from the official garage, which was the Auditorium. Immediately other contestants demanded that a Contest Board man be present at the examination and the Cadillac was called back and re-examined when F. E. Edwards arrived in Milwaukee.

The Jonas company claims the Cadillac was marked perfect at the first examination and that the three points imposed when Mr. Edwards arrived might have been due to damage sustained by the car while out of the official garage. In addition the company claims the committee had no right to release the car and then recall it.

Premier Fleet on Last Stage

RENO, NEV., July 31—Still ten cars strong, the flotilla of Premier automobiles owned and driven by amateurs on a pleasure jaunt across the continent from Atlantic City, N. J., to San Francisco and Los Angeles, is on the home stretch. The party will essay the climb of the Sierra Nevada mountains, probably in the vicinity of Truckee, the intention being to proceed to San Francisco by the northern route.

Diller, Neb., Helps Form Club

OMAHA, July 31—The southern counties in Nebraska are especially interested in good roads and in automobile clubs. D. E. Watkins, secretary of the Nebraska Automobile Club, made a tour through these counties, last week, organizing automobile clubs. The little town of Diller, whose five hundred inhabitants have stirred up such an interest in good roads in southern Nabraska, still has the same keen spirit. A meeting was held at Fairbury, Monday night, and fifteen automobiles drove the fifteen miles to Fairbury from Diller. There was a large attendance at the meeting, and the club was formed with fifty-one charter members. The following officers were elected: J. W. McDonnell, Fairbury, president; L. M. Nelson, Fairbury, vice-president; W. M. Lewis, Fairbury, secretary and treasurer. A director was elected from each township in the county to oversee the roads of that township.

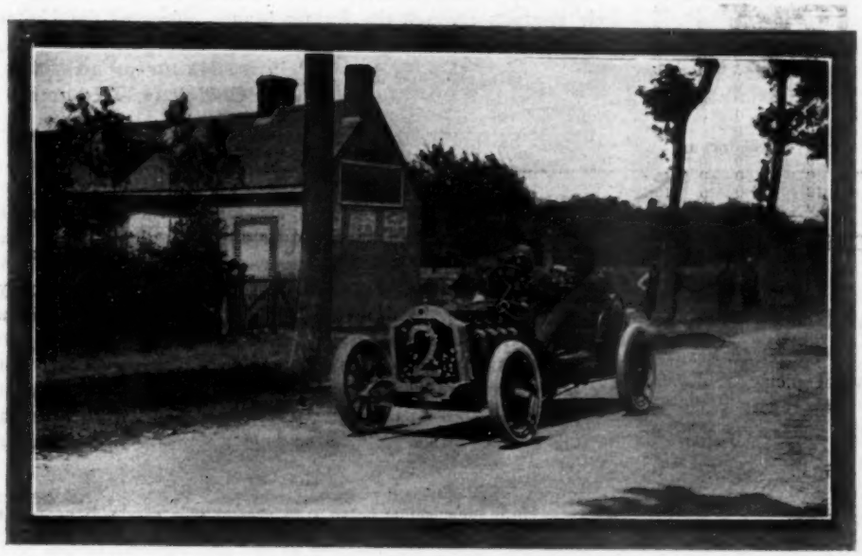


Fig. 3—Maurice Fournier, snapped a few minutes before his fatal accident, due to the breaking of the front axle

Syracuse Club Host to Orphans

SYRACUSE, N. Y., July 31—One hundred and seventy-eight of the children of The Onondaga Orphans' Home were guests of the Automobile Club of Syracuse, Thursday of last week, on a motor car ride about the city and to the Onondaga Indian Reservation, concluding with an outing on the farm of Edward I. Rice, at Dorwin Springs.

Fifty cars were loaned by members of the club, and there were several cars sent in excess of the demand.

All but a dozen children enjoyed the outing. These youngsters, who were suffering from whooping cough, were promised a joy ride of their own as soon as they shall have recovered.

Barnes to Sell Steel Castings

Claire L. Barnes & Company has completed arrangements whereby it becomes direct factory representative, selling the entire output of the Fort Pitt Steel Casting Co., McKeesport, Pa., makers of small steel castings exclusively, from a direct steel process.

Minnesota Winners: Marmon; Flanders

With clean road scores after a grueling drive across the mountains to Helena, the Marmon touring car and two Flanders runabouts were awarded the honors in the registered classes in the annual tour of the Minnesota State A. A. All the contestants in the unregistered division were given clean scores. The affair proved to be an unqualified success.

HELENA, MONT., July 29—According to the announcement of Referee Dutton to-day, the Marmon driven by B. Fawkes, and two of the three Flanders, Nos. 12 and 14, were clean in the regular competition in the Minneapolis-Helena automobile run that has ended here, after a tour of nine days.

The Minneapolis *Journal* trophy was awarded to the Marmon in the Touring car class, while No. 12 Flanders was given the Phillips trophy in the runabout class, with the Gregg trophy going to the No. 14 Flanders as second prize. The Colby, which had 5 points against it, was given the Warner trophy as second prize in the touring car class.

It still is undecided which of the four cars will get the special Minnesota State Automobile Association trophy which was put up for competition among the cars which had not been registered as stock with the Contest Board. All four of these—a Pierce-Arrow, a Packard and two Kisselkars—are eligible, for each had a perfect score.

The contest was run under grade 3 of the A. A. A. rules, penalizations being only for work and time and with no technical examinations at the end of the run. Had there been one it almost is certain none of the cars that participated would have been perfect.

The tour was unique in that it was accompanied by a special train on the Great Northern Railroad, furnished by President Louis Hill, which was used by the tourists for a hotel, meals being eaten aboard by the motor travelers. Another feature of the run was the good roads angle. A prize, the Hill trophy, was offered the Montana county having the best roads. By vote of contestants this was given to Lewis and Clark county.

Fig. 4—General view at the start, incidentally showing one of the bad turns and the handful of spectators

Four of the cars in the tour, accompanied by one from Helena, continued from here to Glacier National Park, 250 miles farther in the heart of the Rockies, as guests of Louis Hill, president of the Great Northern. A run will be made by motor to Kalispell, a 2-day trip, then follows a 3-day journey on horses through the park. The cars in this trip are the Brictson Pierce-Arrow, which acted as press car on the tour; C. P. Merwin's Corbin, the pacemaker; Louis Hill's Packard and Walter Berkey's Packard. The party is accompanied by the special train. The summary:

No.	Car and driver.	1st day	2nd day	3rd day	4th day	5th day	6th day	7th day	8th day	9th day	Total
1	Maxwell, O. W. Klose	0	0	0	121	0	0	0	21	0	142
2	Marmon, B. Fawkes	0	0	0	0	0	0	0	0	0	0
3	Amplex, R. P. Wiseman	0	0	0	6	14	3	Withdrawn			
4	Halladay, O. A. Palmlund	0	0	0	36	8	0	0	0	0	44
*5	Kisselkar, C. L. Bonwell	0	0	0	0	0	0	0	0	0	0
*6	Kisselkar, C. Rice	0	0	0	0	0	0	0	0	0	0
*7	Pierce-Arrow, J. Suckow	0	0	0	0	0	0	0	0	0	0
8	Hupmobile, E. B. Stimson	0	0	0	0	0	0	7	3	0	10
9	Abbott-Detroit, A. N. Smith	0	0	0	0	0	6	0	0	0	6
10	Stoddard-Dayton, J. H. Prior	0	0	0	180	15	0	0	0	0	195
11	Colby, M. G. Armstrong	0	0	2	0	3	0	0	0	0	5
12	Flanders, B. M. Scott	0	0	0	0	0	0	0	0	0	0
13	Flanders, F. A. Witt	0	0	0	0	0	0	Withdrawn			
14	Flanders, G. Herron	0	0	0	0	0	0	0	0	0	0
15	Krit, J. E. Dougherty	0	12	38	0	996	0	0	0	0	1046
16	Petrel, A. L. McNurlen	0	0	3	12	83	12	6	0	0	116
17	Cole, B. T. Hoyt	0	0	5	0	0	0	3	0	0	8
18	Cole, W. L. Rose	0	0	0	461	0	0	0	0	0	461
*19	Packard, W. Stork	0	0	0	0	0	0	0	0	0	0

*Non-registered class.

Franklin Workers Enjoy Picnic

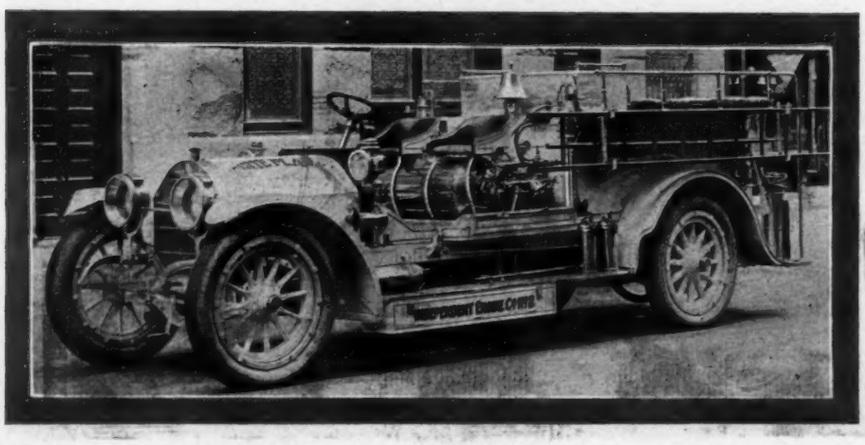
SYRACUSE, N. Y. July 31—The employees of The H. H. Franklin Manufacturing Company held their anuual picnic at Long Branch to-day, 4,000 persons being present. The resort is a few miles from Syracuse and reached by trolley. A feature was a concert given by a band of twenty pieces. There were various athletic events. It was the largest-attended picnic the Franklin forces have ever held.

Locomobile Fire Wagon for White Plains

While the tendency to displace horse-drawn fire apparatus by motor-driven vehicles is very pronounced in the large cities of the land it is even stronger in the suburban localities and in the smaller cities.

The following towns near New York have contracted for motor fire apparatus, some of which is being delivered now and some of which has been installed: Passaic, Paterson, Newark, Bronxville, Irvington and White Plains. In the latter place a Locomobile combination chemical and hose wagon has just been delivered.

The new wagon is rated as 40-horsepower, four cylinders, 5 by 6 inches. Ten men can ride on it and there is room for 1,000 feet of hose and two chemical tanks with ladders and other equipment.



Locomobile combination fire wagon in service at White Plains, which was recently delivered to that town

U. M. Parts From Component Companies

The dissolution of business relations of the United Manufacturers as a sales organization with four of its chief elements has been officially announced, following a series of conferences, the last of which took place Tuesday, Aug. 1.

The full text of the announcement is as follows:

"The United Manufacturers, as a sales organization, has discontinued the sale of the products of—

"Weed Chain Tire Grip Co., Bridgeport, Conn.

"The Jones Speedometer, New Rochelle, N. Y.

"N. Y. & N. J. Lubricant Co., 165 B'way, New York City.

"C. A. Metzger, Inc., 239 W. 56th Street, New York City.

"The desire to avoid the appearance of a combination in restraint of trade is the purpose of this step.

"The above manufacturers will continue the distribution of their products through the former branch offices of the United Manufacturers, in charge of their branch managers.

"UNITED MANUFACTURERS,
"G. C. Holmes, Treasurer."

Jersey Trade Seeks Open Door

NEWARK, N. J., Aug. 3—The New Jersey Automobile Trade Association, which has hitherto held itself aloof from the wrangles incidental to the administration of the present New Jersey automobile law, has come out squarely against the policy of J. B. R. Smith, Commissioner of Motor Vehicles, and in a series of resolutions, requested him to recede from a position which the association believes is inimical not only to the best interests of automobiling, but of the State of New Jersey at large. The resolutions which were unanimously passed at a meeting of the Trade Association held a few days ago, are as follows:

"Resolved, That in view of the fact that New York State has for all past years since automobiling began (this present year excepted) permitted all residents of New Jersey to enter and use her hundreds of miles of improved roads with the same freedom as her own citizens, provided only that they were duly registered in their own State, notwithstanding that New Jersey has compelled her (New York's) residents to submit to many indignities and to pay a tax; and the further fact that New York stands ready now to grant the free use of her roads to citizens of New Jersey should New Jersey grant her citizens the same privileges, it is the unanimous opinion of the New Jersey Automobile Trade Association that the action of the Commissioner of Motor Vehicles, J. B. R. Smith, in withdrawing from residents of New York the slight privilege which our State law concedes them now, shows a feeling of resentment which one State of the Union should not show to another, and is, in our opinion, very bad judgment; and it is further

"Resolved, That the general principle of serving notice on residents of New York, Pennsylvania and Delaware in effect that they are not welcome to our State is going to do the manufacturing, hotel, real estate and all other business interests of New Jersey untold injury which will take years to make up for, in addition to giving our State a reputation for narrowness of which she is not deserving.

"It is further resolved, That a set of these resolutions be forwarded to Commissioner J. B. R. Smith with the request that he immediately reconsider his action."

The New Jersey Automobile Trade Association, which is composed of the leading dealers of the State, stands committed to the policy set forth, and it is understood, will wage a vigorous campaign for the re-establishment of the eight-day touring privileges to non-resident motorists such as the New Jersey law provides, but which Commissioner Smith has abrogated in the case of certain States.

Heads Croxton Sales Dept.

Geo. S. Patterson, formerly branch manager of the Thomas B. Jefferies Company, and later with The White Company, has been elected general sales manager of the new Croxton Motor Company, of Cleveland, Ohio, and will take full charge of the sales of this company which will manufacture taxicabs, pleasure cars and trucks.

Glidden to Be Good Roads Tour

Owing to the lack of sufficient entries the postponed Glidden tour of 1911 has been abandoned and in its place the tour of 1911 will take place in October and be run over the route of the National Highway, extending from New York to Jacksonville via Atlanta.

Returning to the original idea of the donor of the trophy, the tour, appealing particularly to owners, will be conducted under regulations demanding reliability and regularity, without reference to rigid technical restrictions.

From the Atlanta Chamber of Commerce and the Jacksonville Board of Trade came representatives who were prepared to negotiate a definite proposition. Atlanta was represented by Edwin P. Ansley and Major John S. Cohen. H. B. Race spoke for Jacksonville.

The 1911 Tour will be conducted under Grade IV of the A. A. A. Reliability Rules, with practicable daily running schedules, possible of accomplishment by any tourist.

The cars will be stamped in their essential parts, there will be no observers and the only penalty assessed will be for lateness at controls. A nominal entry fee of $25 will be charged and present indications point to a large entry list of individual owners.

A $200 cash prize will be offered for the best performance in each of the seven price divisions.

Any owner of a stock car shall be eligible to enter.

Entry blanks and full conditions will be issued immediately.

Saurer Truck Reaches New York

Marked with travel stains but otherwise apparently in good shape the transcontinental Saurer truck came to an end of its long journey Wednesday afternoon in New York.

The truck was run down to the City Hall and then up Fifth avenue and came to rest at its garage on Fifty-fifth street. The Motor Truck Club acted as escort for the big car. The car left Denver for New York via San Francisco on March 1 carrying a load of three tons and worked its way across the continental divide and up the Pacific coast. Thence it started eastward and climbed the mountains; forded the rivers and crossed the deserts to the Mississippi valley, completing the last 1,000 miles by easy stages.

Senator Company Ready to Start

PITTSBURGH, July 31—The Senator Motor Car Company, capital $200,000, has completed its organization as follows: President, C. E. Vance, of the Consolidated Manufacturing Company and the Anchor Packing Company, of Philadelphia; treasurer, P. T. Coburn, who was formerly advertising manager of the Westinghouse Electric & Manufacturing Company, of Pittsburgh; secretary and manager, A. F. Schmidt, formerly with the Penn Motor Car Company, of Pittsburgh. The directors are John F. Edmunds, of the Anchor Packing Company, of Philadelphia; Dr. E. R. Walters, head of the Department of Health, of Pittsburgh, and G. C. Campbell, of Pittsburgh.

The company has established offices in the Jenkins Arcade Building on Liberty avenue. It is going to locate on Pennsylvania avenue, North Side, and is fitting up two buildings 80 x 400 and 300 x 400 for its use. It will manufacture four distinct types of cars; a two-seated roadster of 40 horsepower to sell for $1,250 and up; a light delivery truck of 35 horsepower capacity, 1,500 pounds, to sell for $1,000; a heavy delivery truck, capacity three to five tons and of 60 horsepower; a four-seated touring car to sell for $1,800. The roadster will have a 116-inch wheelbase and a 34-inch wheel with 4-inch tires. It will have a straight line drive, low center of gravity, thus distributing the vibration between the axles. A feature of the car will be the straight pulls on the brakes. The company expects to build 1,000 of these roadsters next year.

New "Six" Makes Its Début

MILWAUKEE, July 31—Carl Lipman, president of the Lipman Manufacturing Co., Beloit, Wis., centrifugal pumps, etc., has brought out a six-cylinder touring car built according to his own specifications and for the most part in his own shops. It is highly probable that Mr. Lipman will organize a company to manufacture the car at Beloit. The six cylinders are cast in pairs and a feature of their construction is the fact that the cylinder dome is removable, to permit of ready access to the combustion chamber and the valve mechanism in order to make inspection easy.

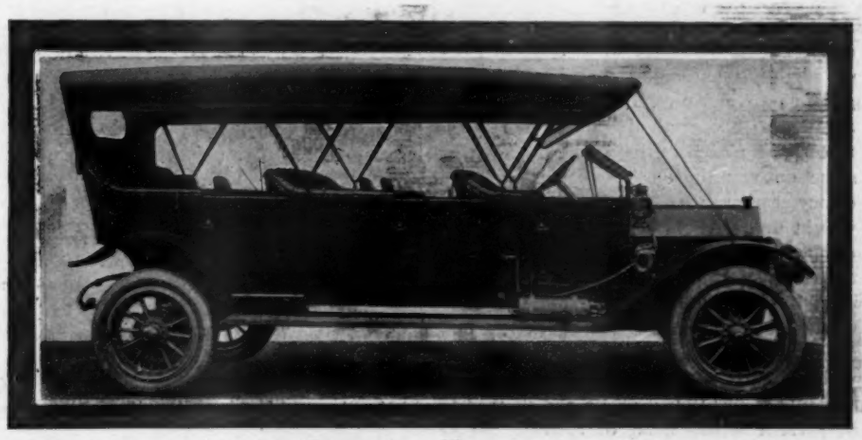
Ignition is by high-tension magneto, cooling by a Lipman centrifugal pump, and the car is supplied with a self-starting device of Mr. Lipman's own invention. The car is fitted with annular bearings throughout. It weighs about 2,400 pounds as put up by Lipman with a toy tonneau, 122-inch wheelbase and 36-inch wheels.

Weed Chain Patent Upheld

CHICAGO, July 27—By decision of the Circuit Court of Appeals in the northern district of Illinois, what is familiarly known as the Parsons patent covering the right to manufacture anti-skid chains for motor car wheels was to-day upheld and the decision of this court made in January, 1911, reversed. The decision was reached by Judges Grosscup, Baker and Kohlsaat, circuit judges, and is the finding in the case of Patent Excelsior or Supply Co. and Motor Appliances Co. vs. Weed Chain Tire Grip Co., Harry D. Weed and Parsons Non-Skid Company, Limited.

General Motors Truck Company

LANSING, MICH., July 31—The General Motors Company, of which the Olds Motor Works is a constituent part, has announced the formation of a selling and service company, under the name of General Motors Truck Company, to market its entire product of commercial cars. The formation of the separate company has been effected to concentrate the efforts of the manufacturing and the selling ends of the business on their respective lines.



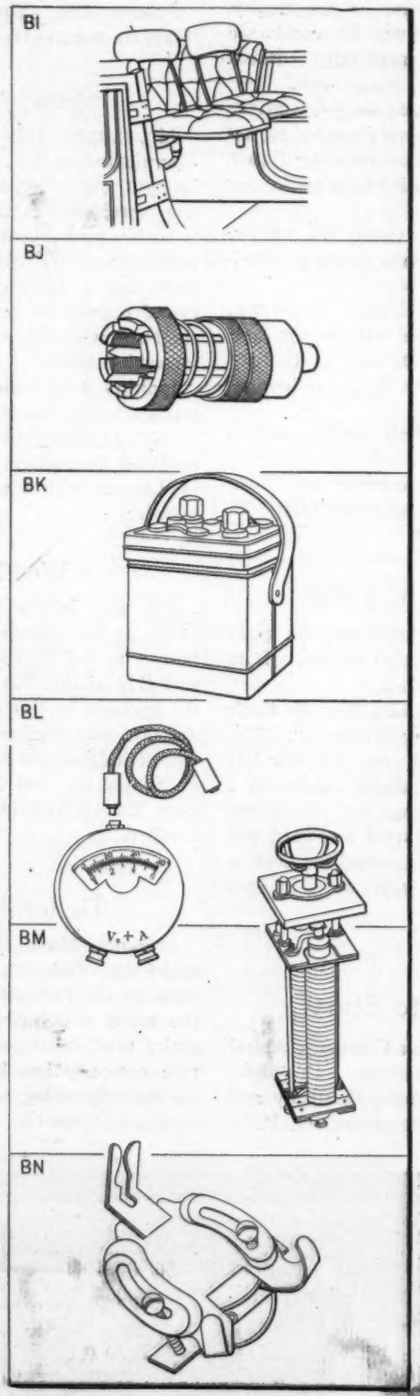
Twelve-passenger torpedo recently shipped by Atlas Motor Car Company for summer resort work

Seen in the Show Window

EXTRA seats which fold out of the way when not in use certainly make for comfort, except when they invite some indiscreet acquaintance to force his personality upon the polite owner of the car; but this is only the exception proving the rule, and if the automobilist desires to equip his machine with extra seats, it will be the course of economy to get high-class goods, even though they may be a little high priced. Quality is the principal claim made for the patent Luxury folding seats (BI), the framework of which is made of drop-forged steel, making possible a rugged and compact construction, while artistic design and finish furnish the good looks. These seats are the product of the Graves & Congdon Company, Amesbury, Mass.

REMEMBERING that the cooling water as it flows from the radiator to the engine cylinder jackets is moved through the office of a pump, and that this latter puts the water under pressure, it is easily understood that all water hose must be absolutely waterproof, and connections very tight lest some water be lost. This would not only result in the water being spilled all over the power plant, but the motor not being cooled to a sufficient measure would be damaged by the process. To avoid leaky connections hose is generally pressed against a pipe with some wire, but besides the fact that this is not a reliable method, the hose will suffer and in time will be cut by the wire. A pump connection using a similar principle in a refined sort of way is seen at (BJ), it being the Nielsen's. It is attached by pulling back the ring pressed by a spring against its seat which is cut into six sections. Thereafter the end of the hose is slipped over these sections and held in place and the ring pushed into place by the pressure of the spring. The Auto Equipment Manufacturing Company, of 18 Pearl street, Newton, Mass., market this device.

STORAGE batteries, so widely used for lighting automobiles and igniting the gasoline-air mixture, differ principally on account of the method of how the active material is placed in the plates, a good construction resulting in an increase of efficiency rather than one of capacity per weight unit. At the same time, a high efficiency is indicative of a relatively long battery life, proving that one virtue is always in another virtue's company. The illustration (BK) shows the Bison Sparker, a battery comprising three six-volt cells which will last through 40 ampere-hours, and the advantages mentioned above are claimed to be present in this make of battery. At all events, the illustration gives an idea of the compact and strong construction of the battery which is made by the Bison Storage Battery Company, of 38 Riley street, Buffalo, N. Y.



BI—Luxury folding seats are comfortable and elegant

BJ—The Nielsen connection holds hose in tight relation

BK—Ignition type of the Bison-Sparker storage battery

BL—The Rear-Rite voltammeter is made in pocket size

BM—Rheostat for lowering the voltage of battery-charging circuit

BN—Sterling time clutch for holding watch to steering wheel

MEASUREMENTS are now made compact and precise, owing to the vast experience of the manufacturers of the meters and instruments used for the purpose, and while the first of these products necessarily had to be of medium size, since it then was not possible to combine the features of miniature and precision, capable instruments are now manufactured, these being of sufficiently small size to be carried in one's vest pocket. In Fig. (BL) we illustrate the Read-Rite, which is a volt-ammeter and made by the Read-Rite Meter Works at 18 Main street, Buffalo, N. Y. The plug connecting the meter with the electric line to be tested can be taken out of its socket and kept separately.

ELECTRIC accumulators cannot be charged directly from a high-tension main since too high a voltage would do damage to the cells. It is for this reason that some kind of resistance must be used and placed in the circuit to reduce the voltage, and of these resistances, lamps are the most popular, though not the handiest. A small and effective resistance is the battery-charging rheostat illustrated at (BM) containing no wires or grid which might be burned out by the process of charging, and it may be mounted either on a wall or switchboard. The working parts being well insulated are not affected by moisture which therefore does not disturb the successful operation of the rheostat. It is sold by Howard M. Eldred, of 818 Pabst Building, Milwaukee, Wis.

EVERY automobilist will admit that he likes to have the time before him when driving, but not every one will indulge in the expense of buying a specially constructed timepiece to be permanently attached to the car. Automobile operators will be interested in the realization of a very practical scheme by which it is possible to attach one's watch instantly and safely to the steering wheel of the car, without fear that it will be thrown off by the movements of the machine. The winding post of the watch slips into the notch of the time clutch (BN), and the whole thing is supported by the two bent-up pieces of metal. The clutch is screwed on to a nave of the steering wheel; it is furnished in nickel, polished brass or gun metal finish by its makers, the Sterling Manufacturing Company, Inc., Staunton, Va.